ARITHMETIC
MADE EASY,

For the Uſe and Benefit of

TRADES-MEN:

Wherein the

Nature and Uſe of *FRACTIONS*, both *Vulgar* and *Decimal* are Taught by a new and exact Method.

ALSO

The MENSURATION of SOLIDS and SUPERFICIES.

To which is added,

A Short and Eaſy METHOD of BOOK-KEEPING,
After the *Italian* Method.

With DIRECTIONS how Shop Keepers may ſtate, poſt and balance their Books of Accompts.

By *THOMAS WISE*, Accomptant.

The THIRD EDITION, *Reviſed and Corrected.*

BERWICK,
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ARITHMETIC

MADE EASY,

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TRADES-MEN.

ARITHMETIC is the *art* of working by *numbers*.

Properly ſpeaking, all operations in *arithmetic* are nothing elſe but *addition* and *ſubtraction*; for *multiplication* is frequent *addition*, and *diviſion* is frequent *ſubtraction*.

The valuing or reading of numbers is called *notation*, or numeration.

In *notation* we muſt obſerve that all numbers may be, and now generally are expreſſed by, or compoſed of the ten figures or characters following, *viz.*

One, two, three, four, five, six, seven, eight, nine, cypher.

1 2 3 4 5 6 7 8 9 0

Nine of theſe are called ſignificant figures, to diſtinguiſh them from the cypher, which of itſelf ſignifies nothing; but as it is placed (in whole numbers) ſerves to increaſe the value of the next figure or figures that ſtand before it; as 3 is but three: but before the cypher thus, 30, the 3 becomes 30, *&c.* —— We are to note, that every one, or any of the above nine figures or digits have two values, one certain and another uncertain: the certain value is, when it ſtands alone by itſelf: the uncertain is, when joined or placed with other figures or cyphers: for when any one of theſe figures ſtands alone, it ſignifies no more than its own ſimple value: as 5 is but five, 4 but four, 6 is but ſix, and 3 no more than three, *&c.* And this is the certain value of a figure: but when another figure or cypher is annexed, then they are increaſed in their value ten times: as 5, or 5 unites, or ones, to five tens, or fifty, 4 to 4 tens, or forty, 6 to 6 tens, or ſixty, and 3 to 3 tens, or thirty, as thus, 51, fifty-one: 42, forty-two: 63, ſixty-three: 34, thirty-four, *&c.* Again, if any of the ſaid figures ſtand in the third place towards the left-hand, they then ſignify ſo many hundreds as ſingly they expreſs units or ones, as 500 is five hundreds, 400 four hundreds, 600 ſix hundreds, and 300 three hundreds, *&c.* If any of them poſſeſs the fourth place towards the left-hand, they are ſo many thouſands as they contain units: and ſo any, or every figure increaſes by a ten fold proportion, from the right-hand to the left, according to the place it is found or ſtands in; ſo that 5 may be but five, or fifty; five hundred, or five thouſand; in the firſt place, 5; in the ſecond, 50; in the third, 500; and in the fourth place, 5000, *&c.*

The Numeration Table.

12	11	10	9	8	7	6	5	4	3	2	1	Thousands of millions	Millions	Thousands	Units, or ones
Hundred of thousands of millions	Tens of thousands of millions	Thousands of millions	Hundreds of millions	Tens of millions	Millions	Hundreds of thousands	Tens of thousands	Thousands	Hundreds	Tens	Unites				
1	2	3	4	5	6	7	8	9	0	1	2	123	456	789	012
	1	2	3	4	5	6	7	8	9	0	1	12	345	678	901
		1	2	3	4	5	6	7	8	9	0	1	234	567	890
			1	2	3	4	5	6	7	8	9		123	456	789
				1	2	3	4	5	6	7	8		12	345	678
					1	2	3	4	5	6	7		1	234	567
						1	2	3	4	5	6			123	456
							1	2	3	4	5			12	345
								1	2	3	4			1	234
									1	2	3				123
										1	2				12
											1				1

For the eaſier reading of any number, firſt get the words at the head of the table by heart; as units, tens, hundreds, thouſands, &c. and applied thus, 75, five units, five, and 7 tens, ſeventy, that is, ſeventy five. Again, 678; 8 units, eight, 7 tens, ſeventy; and 6 hundreds, ſix hundreds; that is, ſix hundred ſeventy eight. Once more, 3456; 6 units, ſix; 5 tens, fifty; 4 hundreds, four hundred; 3 thouſands, three thouſands; together, three thouſand four hundred fifty ſix. Read the

4th line of the table downwards, viz. 123456789; here the valuation of the figures is from the right hand to the left, as 1 in the ninth place is hundreds of millions, but to be read from the left hand to the right; thus, one hundred twenty three millions, four hundred fifty ſix thouſand, ſeven hundred eighty nine. But any number may yet be read more intelligibly, viz. by ſtops, thus; make a comma at every third figure or cypher, beginning at the right hand, and ſo on towards the left, making a ſtop after every third figure or cypher, as aforeſaid, thereby diſtinguiſhing every third place into hundreds, as hundreds of units, hundreds of thouſands, hundreds of millions, and hundred thouſands of millions, &c. and for tryal let's read the firſt line of the tab'e; the laſt place in valuation is hundred thouſands of millions, and to be pointed into periods thus, 123,456,789,012; and read thus, one hundred twenty three thouſand, four hundred fifty ſix millions, ſeven hundred eighty nine thouſand and twelve; that is no hundreds, but twelve. Again, read the following number, viz. 276,245,678,921,460; here the firſt point or period is betwixt 4 and 1, and the laſt between 2 and 6, and to be read thus; 276 millions of millions, 245 thouſands of millions, 678 millions, 921 thouſands, 460 units or ones. And thus may any number be read with eaſe, though a large one; and thus are large numbers or ſums expreſſed, or ſet out in the exchequer, bank, and lottery tickets, &c. as thus, No. 225,156-----19,478-----and 42,000, &c. the foregoing table of numeration is on the right hand diſtanced out into periods, for the eaſier reading thereof.

Numbers to be read and written.

96, Ninety ſix
242, Two hundred forty two
7924, Seven thouſand nine hundred 24
54006, Fifty four thouſand and ſix
524707, Five hundred twenty four thouſand 707
4606240, Four millions 606 thouſand 240
62700472, Sixty two millions 700 thouſand 472
474960204, Four hun. 74 millions 960 thouſ. 204
4214007042, Four thouſ. 214 millions 7 thouſand 42
470706420042, Four hundred and 70 thouſand 706 millions 420 thouſand and 42.

Of numerical letters.

Sometimes numbers are expreſſed by letters; eſpecially in the bible, to ſignify the chapter or pſalm; at the bottom of title pages of books for the date of the year, and frequently in inſcriptions on funeral monuments, *&c.* for which reaſon 'tis neceſſary to know how to read them. Therefore obſerve, that I. ſtands for 1, or one unit, II. for 2. III. for 3. IV. for 4. V. for 5. VI. for 6. VII. for 7. VIII. for 8. IX. for 9. X. for 10. XI. for 11. XII. for 12. XIII. for 13. XIV. for 14. XV. for 15. XVI. for 16. XVII. for 17. XVIII. for 18. XIX. for 19. XX. for 20. XXI. for 21. *&c.* XXX. for 30. XXXI. for 31. *&c.* XL. for 40. XLV. for 45. *&c.* L. for 50. LI. for 51. *&c.* LX. for 60. LXI. for 61. *&c.* LXX. for 70. LXXI. for 71. *&c.* LXXX. for 80. LXXXI. for 81. *&c.* XC. for 90. XCI. for 91. *&c.* C. for 100. CC. for 200. CCC. for 300. CCCC. for 400. D. or IↃ. for 500. DC. for 600. *&c.* M. or CIↃ. for 1000. *&c.* Thus the preſent year 1757. is wrote M DCC LVII.

ADDITION.

IS the putting together two or more numbers or ſums in order to make them one total, or whole ſum.

Here we muſt always obſerve to ſet the numbers to be added, orderly one under the other; that is, units under units, tens under tens, hundreds under hundreds, *&c.* as in the ſubſequent examples.

Addition of numbers of one denomination.

Yards		*Gallons*			*Pounds*				
Tens	Units	Hund.	Tens	Units	X of Th	Thouf.	Hund.	Tens	Units
2	4	7	5	6	5	7	7	6	2
4	6	5	3	2	3	9	9	4	4
6	8	4	7	8	6	7	2	2	2
8	2	6	9	6	7	9	6	7	4
2	4	4	2	2	0	2	4	6	2
4	2	6	7	8	0	0	3	9	0
2	8	6	3	5	6	2	2	4	7

In addition of ſimple numbers, whether it be *yards*, *gallons*, *pounds*, or any thing elſe, remember to carry 1 for every 10 you find in the row or rank of figures being units to the next row of tens; and the like from the rank of tens to the row of hundreds, *&c.* and whatever it makes in the laſt, you muſt ſet it down, amount to what it will. Thus:

The numbers above are ſet down in order, as before directed; that is, units under units, tens under tens, *&c.* as may be plainly underſtood, by being indicated at the head of each row or rank with units, tens, hundreds, *&c.* Then in caſting up each example, to know its total, I begin at the right hand, or units rank, of the firſt example, and ſay 2 and 4 is 6, and 2 is 8, and 8 is 16, and 6 is 22, and 4 is 26; in which row there are two tens and 6 over; wherefore I ſet down 6 juſt under its own rank, and carry 2 to the next or laſt row, and ſay, 2 that I carry and four makes 6, and 2 is 8, and 8 is 16, and 6 is 22, and 4 is 26, and 2 is 28; and it being the laſt row, I ſet down the amount, *viz.* 28; ſo that the total number of *yards* is found to be (by the method) at the bottom 286. And the next, or ſecond example, is found by the ſame method to be 3562 *gallons*. And in the third and laſt example, the total number of pounds is found to be 247484. and ſo the total of any other example of the ſame kind, *viz.* ſimple numbers of one denomination, may be found. *Note*, that when any of the ranks amount to juſt 10, 20, 30, 40, 50, *&c.* then

you muſt ſet down the 0, under its proper rank, and carry either 1, 2, 3, 4, or 5, according to the number of tens that you find, to the next row; and ſo you muſt always do, when it ſo happens, whether in the firſt, ſecond or third row, or in any other except the laſt, where what it amounts to muſt be ſet down without any reſerve or carriage in the mind, becauſe there is no other row or rank to carry to, as was hinted before.

Addition of mixed numbers.

Obſerve, 4 farthings make 1 penny, 12 pence make 1 ſhilling, 20 ſhillings make 1 pound ſterling.

Libra in *Latin* ſignifying a pound, *l.* therefore ſtands for pounds.

Solidus in *Latin* ſignifying a ſhilling, *s.* therefore ſtands for ſhillings.

Denarius in *Latin* ſignifying a penny, *d.* therefore ſtands for pence.

Quadrans in *Latin* ſignifying a farthing, *q.* therefore ſtands for farthings.

Obſerve, that pounds be ſet directly under pounds, ſhillings under ſhillings, pence under pence, and farthings under farthings.

But before you proceed, get this table of pence by heart, thus, 30*d.* is half a crown, then 60*d.* is 5*s.* again 40*d.* is 3*s.* 4*d.* then 80*d* is 6*s.* 8*d.* again 50*d* is 4*s.* 2*d.* then 100*d.* is 8*s* 4*d.* &c. 100 lb. of cheeſe at 3*d.* the lb. comes to three times 8*s.* 4*d.* or 100 faggots, 120 to the hundred, at 1*d.* a-piece, comes to 10*s.* as in the table.

d.		*s.*	*d.*	*d.*		*s.*	*d.*
20		1	8	30		1	10
30		2	6	40		2	00
40		3	4	50		2	10
50		4	2	60		3	00
60		5	0	70		3	10
70	is	5	10	80	is	4	00
80		6	8	90		4	10
90		7	6	100		5	00
100		8	4	110		5	10
110		9	2	120		6	00
120		10	0	130		6	10

Then for every crown that a hundred of faggots coſt, reckon an half-penny; if the faggot coſts me three halfpence, one hundred will coſt 15 *s.* becauſe there is three crowns in it.

Note, That young men may improve themſelves very much in reckoning up divers things, after they have by heart the table aforeſaid, and learning this rule of addition.

An hundred yards of tape at one penny the yard, the table tells you comes to 8*s.* 4*d.*

An hundred yards of ferreting at one penny half-penny the yard.

In the table 100*d.* is - - -	8*s.*	4*d.*
And half the ſum is - - - -	4*s.*	2*d.*
Anſwer	12*s.*	6*d.*

If one pound of any thing coſts 7 *d.* halfpenny, what will 280 lb. weight coſt after that rate; performed by addition thus,

	l.	*s.*	*d.*
200 ſixpences make 100*s.* or - -	5	—	-
80 ſixpences make - - - -	2	—	-
200 pence - - - - - -	-	16	8
80 pence is a noble, or - - -	-	6	8
200 halfpence is 100 pence, or -	-	8	4
80 halfpence make 10 groats, or -	-	3	4
Price of the goods	8	15	0

Note, Now you have by heart the table of pence, you may caſt up any ſum of money without dotting, for when you know the number of pence, you may by this table, know how many ſhillings to carry to the ſhillings place, and for the number of ſhillings in the row of ſhillings you know that 70*s.* is 3*l.* 10*s.*

(10) *l.*	(20) *s.*	(12) *d.*
17	16.	1
20	11.	7.
23	18.	9.
73	17	10
136	4	3

12 ſet over the pence, ſhews that for every 12 I find in the pence row, I am to carry 1 to the ſhillings; for ſo many 20*s.* as I find in the ſhillings row, 1 to the place of pounds, as aforeſaid.

But the eaſieſt way of caſting up this ſum (for the young learner) is by uſing dotes, thus:

Beginning at the pence; I ſay 10*d.* and 9*d* is 19*d.* where againſt the 9 I ſet a dot for 12*d*, (or you may make your dots on waſte paper) and what is more or above 12 I carry to the next figure, *viz.* 7, and it makes 14, where I ſet a dot alſo for 12, and carry the remaining 2 to the 1 on the top, which makes 3, which 3*d.* I ſet between the lines, as you ſee in the example.

Next, I look how many dots there are, and find 2, which I carry to the row of ſhillings, ſaying, 2 that I carry and 17 is 19, and 18 is 37, where againſt the 18 I ſet a dot for 20*s.* or 1*l.* and carry the odd 17*s.* upwards, ſaying, 17*s.* I carry and 11 is 28, where I ſet a dot againſt the 11 for another 20*s.* and carry the remaining 8 to the 16 on the top, ſaying 8 I carry and 16 makes 24*s.* where I ſet down a dot for 20*s.* and ſet between the lines the remaining 4*s.* under the row of ſhillings.

Note, That you may ſum up the ſhillings row without dotting, thus; ſaying, 2*s.* I carry from the place of pence, and 7 is 9, and 8 is 17, and 1 is 18, and 6 is 24, and 10 is 34, and 10 is 44, and 10 is 54, and 10 is 64, that is 3*l.* 4*s.* then the 4*s.* being ſet between the lines, the 2*l.* is to be carried to the pounds.

Laſtly, The 3 dots for the 3*l.* found in the place of ſhillings, I carry to the pounds, ſaying, 3 that I carry and 3 is 6, and 3 is 9, and 7 on the top makes 16, the remaining 6 I ſet between the lines, under the firſt row of the pounds, and I carry 1 to the laſt row, ſaying, 1 that I carry, and 7 is 8, and 2 is 10, and 2 is 12, and 1 is 13, which being ſet between the lines, the whole ſum comes to 136*l.* 4*s.* 3*d.*

Note, That when you are to write a bill of ſeveral ſmall parcels, begin it in order of pounds, ſhillings, and pence, 0 - 3 - 9, and when you are to ſet down 16*d.* ſet down 1*s.* 4*d.* or to ſet down 23*s.* you muſt ſet 1*l.* 3*s.* 0*d.*

If a man owes me the three following ſums of money, what come they to in the whole?

l.	*s.*	*d.*
202.	17	$7\frac{1}{2}$
703	1	9
906	10	$1\frac{1}{4}$
1812	9	$5\frac{3}{4}$

Note, That the $7\frac{1}{2}d.$ is seven pence halfpenny; and $1\frac{1}{4}d.$ is one penny farthing; and in the total sum between the lines $5\frac{3}{4}d.$ is five pence three farthings.

To cast up the three sums I do thus, the $\frac{1}{4}$ which is the farthing, and the $\frac{1}{2}$ the halfpenny, make $\frac{3}{4}$, or three farthings, which is set between the lines; next 1*d.* and 9*d.* is 10*d.* and 7*d.* is 17*d.* where against the 7 is set a dot for 12*d.* and set the odd 5*d* between the lines.

Next, 1 that I carry from the place of pence and 10*s.* is 11, and 1 is 12, and 17*s.* is 29*s.* I set down the remaining 9*s.* between the lines, and the 20*s.* making 1*l.* I carry to the place of pounds;

Saying 1 carry, and 6 is 7, and 3 is 10, and 2 is 12, where I set a dot for 10, and set the remaining 2 between the lines.

Next, I carry the dote for 10, as 1, to the middle row (being all cyphers) it is but 1 still, so I set the 1 under the row of cyphers and proceed to the last row;

Saying, 9 and 7 is 16, and 2 at the top is 18, which I set between the lines, and the whole sum comes to 1812*l.* 9*s.* $5\frac{3}{4}d.$

Addition of money.

Money owing, and money received, as follows,

	(1)	*l.*	*s.*	*d.*
Owing to	Mr A. B.	4	12	6
	Mr C. D.	7	06	9
	Mr E. F.	4	12	0
	Mr G. H.	6	17	7
	Mr I. K.	5	06	6
	Mr L. M.	4	12	3
	Mr N. O.	6	00	0
	Mr P. Q.	5	15	4
		45	02	11

	(2)	*l.*	*s.*	*d.*
Received from	R. B.	46	10	9
	R. R.	79	16	0
	C. B.	42	18	3
	R. C.	66	12	4
	C. W.	90	16	0
	R. T.	84	17	6
	G. H.	24	12	0
	B. G.	60	10	0
		496	12	10

I begin and ſay, 4 and 3 is ſeven, and 6 is 13, and 7 is 20, and 9 is 29, and 6 makes 35*d.* now 30*d.* according to the table, is 2*s.* 6*d.* and 5*d.* makes 2*s.* 11*d.* I ſet down 11 exactly under the rank of pence, and ſay, 2*s.* that I carry (which I do to the rank of ſhillings) and 5 is 7, and 2 is 9 (for I only take the unit rank of ſhillings) and 6 is 15, and 7 makes 22, and 2 is 24, and 6 is 30, and 2 makes 32; and now being come to the top of the ſum, and it making 32, I come down with the tens of ſhillings, ſaying, 32 and ten is 42, and 10 is 52, and 10 is 62, and 10 is 72, and 10 makes 82*s.* and the table telling me that 80*s.* is 4*l.* I know therefore 82*s.* is 4*l.* 2*s.* wherefore I ſet down the remaining 2*s.* juſt under the row of ſhillings, and carry 4*l.* to the pounds, ſaying, 4 that I carry, and 5 is 9, and 6 is 15, and 4 is 19, and 5 is 24, and 6 is 30, and 4 is 34, and 7 is 41, and 4 makes 45*l.* ſo that the total of thoſe ſeveral ſums of money due to thoſe ſeveral perſons, amounts to 45*l.* 2*s.* 11*d.* as in the example.

In the ſecond example of money received, I begin at the right hand, and ſay, 6 and 4 is 10, and 3 is 13, and 9 makes 22, and 22*d.* being 1*s.* 10*d.* I ſet down 10, and carry 1*s.* to the ſhillings; ſaying, 1 that I carry and 2 is 3, and 7 is 10, and 6 is 16, and 2 is 18, and 8 is 26, and 6 makes 32; then I come down with the tens, ſaying, 32 and 10 makes 42, *&c.* and I find at the bottom it comes to 112*s.* which making 5*l.* 12*s.* I ſet down 12*s.* and carry 5*l.* to the pounds, ſaying, 5 that I carry and 4 is 9, *&c.* I find at the top it amounts to 36, wherefore I ſet down 6 exactly under its own rank, *viz.* the rank of units of pounds, and carry 3 for the tens that are in 30 (for at all times in the firſt denomination of addition, whether of money, weight, or meaſure; that is in the denomination of pounds, tens, or yards, you muſt caſt them up as ſums of one denomination; that is, for every ten carrying one to the next, *&c*) ſaying, 3 that I carry, and 6 is 9, and 2 is 11, and 8 is 19, *&c.* and I find that at the top it comes to 49; wherefore I ſet down 49 before the 6; and the total amounts to 496*l.* 12*s.* 10*d.*

A Table *of* Engliſh Coins.

Of Gold.

		l.	*s.*	*d.*
A Jacobus,	Value	1	5	0
A Carolus,	Value	1	3	0
A Guinea,	Value	1	1	0
A half Guinea,	Value	0	10	6

Of Silver.

A Crown,	Value	0	5	0
A half Crown,	Value	0	2	6

The names of the reſt ſpeak their vaule, as a ſhilling, a ſixpence, a groat, or 4*d*. a threepence, a twopence, a penny.

Of Copper.

A Halfpenny, A Farthing:

Beſides the above mentioned, we have ſtill in uſe the names of ſome other pieces, which are now but imaginary, *viz.*

		l.	*s.*	*d.*
A Mark,	Value	0	13	4
An Angel,	Value	0	10	0
A Noble,	Value	0	6	8

Of Troy weight.

The leaſt fraction or denomination of weight uſed in *England*, is a grain of wheat gathered out of the middle of the ear, and well dried; from whence are produced theſe following tables of weight, called *Troy weight*.

32 Grains of wheat	Make	24 Artificial grains
24 Artificial grains	Make	1 Penny weight
20 Penny weight	Make	1 Ounce
12 Ounces	Make	1 Pound troy weight

And therefore,

lb.	*oz.*	*p. w.*	*grains.*
1	12	20	24
1	12	240	5760
	1	20	480
		1	24

Troy weight ſerveth to weigh bread, gold, ſilver and electuaries. It alſo regulateth and preſcribeth a form how to keep the money of *England* at a certain ſtandard. The goldſmiths have divided the ounce troy weight into other parts, which they generally call mark weight. The denominative parts thereof are as followeth, viz. a mark (being an ounce troy) is divided into 24 equal parts, called carects, and each carect into 4 grains; ſo that in a mark are 96 grains. By this weight they diſtinguiſh the different firmneſs of their gold; for if to 22 carects of gold be put 2 carects of alloy (which is of ſilver, copper, or other baſer metal, with which they uſe to mix their gold or ſilver to abate the fineneſs thereof) both making when mixed but an ounce or 24 carects, then this gold is ſaid to be 22 carects fine; for if it come to be refined, the 2 carects of alloy will fly away, and leave only 22 carects of pure gold: the like to be conſidered of a greater or leſſer quantity. And as the fineneſs of the gold is eſtimated by carects, ſo the fineneſs of ſilver is diſtinguiſhed by ounces; for if a pound of it be pure, and loſeth nothing in the refining, ſuch ſilver is ſaid to be 12 ounces fine; but if it loſeth any thing, it is ſaid to contain ſo much fineneſs as the loſs wanteth of 12 ounces; as if it loſt 1 ounce 14 penny weight, then it is ſaid to be 10 ounces 6 penny weight fine and that which loſeth 2 ounces 4 penny weight 16 grains, is ſaid to be 9 ounces 15 penny weight 8 grains fine, &c. the like of a greater or leſs quantity.

Of apothecaries weight.

The apothecaries have their weights deduced from troy weight, a pound of troy being the greateſt integer; a table of whoſe diviſion and ſubdiviſion followeth, *viz.*

And therefore,

			lb.	*oz.*	*ſc.*	*dr.*	*gr.*
12 Ounces	Make	1 Pound	1	12	8	3	20
8 Drams	Make	1 Ounce					
3 Scruples	Make	1 Dram	1	12	96	288	5760
20 Grains	Make	1 Scruple		1	8	24	480
					1	3	60
						1	20

Thus much concerning troy weight, and its derivative weights, which, as was ſaid before, ſerveth to weigh bread, gold, ſilver, and electuaries. Now, beſides troy weight, there is another kind of weight uſed in *England*, commonly known by the name of *avoirdupois weight* (1 pound of which is equal to 14 ounces 12 penny weight troy weight): and it ſerveth to weigh all kind of grocery wares, as alſo butter, cheeſe, fleſh, wax, tallow, roſin, pitch, lead, and all ſuch kind of garble; the table of which weight is as followeth.

4 Quarters of a dram	Make	1 Dram
16 Drams	Make	1 Ounce
16 Ounces	Make	1 Pound
28 Pounds	Make	1 Quarter of a hundred
4 Quarters	Make	1 Hund. wt. or 112lb.
20 Hundred	Make	1 Tun

Tun.	*C.*	*qrs.*	*lb.*	*oz.*	*dr.*	*qrs.*
1	20	4	28	16	16	4
1	20	80	2240	25840	573440	2293760
	1	4	112	1792	28672	114688
		1	28	448	7168	28672
			1	16	256	1024
				1	16	64
					1	4

Wool is weighed with this weight, but only the diviſions are not the ſame, a table whereof followeth.

A table of the denominative parts of wool weight.

7 Pounds			1 Clove
2 Cloves			1 Stone
2 Stones		Make	1 Todd
6 Todd 1 ſtone			1 Wey
2 Weys			1 Sack
12 Sacks			1 Laſt

Laſt	*ſack.*	*wey.*	*todd.*	*ſtone.*	*clove.*	*lb.*
1	12	2	$6\frac{1}{2}$	2	2	7
1	12	24	156	312	624	4368
	1	2	13	26	52	364
		1	$6\frac{1}{2}$	13	26	182
			1	2	4	28
				1	2	14
					1	7

Note, That in ſome counties the wey is 256lb. avoirdupois, as the *Suffolk* wey; but in *Eſſex*, there is 336 lb. in a wey.

The leaſt denominative part of liquid meaſure is a pint, which was formerly taken from troy weight (1 pound of wheat, troy weight, making a pint of liquid meaſure): but in regard of the difference between the brewers and farmers of his majeſty's exciſe, concerning the gauging of veſſels, occaſioned by the different opinions of artiſts concerning the ſolid inches in a gallon, it was lately decided by act of parliament; the ſtatute now making 282 ſolid inches in a beer gallon, and 231 in a wine gallon; and conſequently the pint beer meaſure to contain $35\frac{1}{4}$ ſolid inches, and the pint wine meaſure to contain $28\frac{7}{8}$ cubical or ſolid inches. From whence is drawn the following table.

The table of liquid measure.

$35\frac{1}{4}$ Cubical inches	Make	1 Pint beer measure
$28\frac{7}{8}$ Cubical inches		1 Pint wine measure
2 Pints		1 Quart
2 Quarts		1 Pottle
2 Pottles		1 Gallon
8 Gallons		1 Firkin of ale, soap, or herring
9 Gallons		1 Firkin of beer
10 Gallons and a half		1 Firk. of salmon or eels
2 Firkins		1 Kilderkin
2 Kilderkins		1 Barrel
42 Gallons		1 Tierce of wine
63 Gallons		1 Hogshead
2 Hogsheads		1 Pipe or but
2 Pipes or buts		1 Tun of wine

And therefore,

Tuns.	*pipes.*	*hhds.*	*gall.*	*pints.*
1	2	2	63	8
1	2	4	252	2016
	1	2	126	1008
		1	63	504
			1	8

The least denominative part of dry measure is also a pint, and this is likeways taken from troy weight: the table of whose division followeth.

The table of dry measure.

1 Pound troy	Make	1 Pint
2 Pints		1 Quart
2 Quarts		1 Pottle
2 Pottles		1 Gallon
2 Gallons		1 Peck
4 Pecks		1 Bushel
4 Bushels		1 Comb
2 Combs		1 Quarter
4 Quarters		1 Chaldron
5 Quarters		1 Wey
2 Weys		1 Last

And therefore,

Laſt. wey. qrs. com. buſ. pecks. gal. pints.

1—2—5——2——4——4——2—— 8

1—2—10—20—80— 320—640—5120
1— 5—10—40— 160—320—2560
1— 2— 8——32— 64— 512
1— 4——16— 32— 256
1—— 4——8——64
1——2——16
1—— 8

The leaſt denominative of long meaſure is a barley-corn well-dried, and taken out of the middle of the ear; whoſe table of parts followeth.

3 Barley-corns	Make	1 Inch
12 Inches		1 Foot
3 Feet		1 Yard
3 Feet 9 inches, or a yard and a quarter		1 Ell Engliſh
6 Feet		1 Fathom
5 Yards and a half		1 Pole, perch, or rood
40 Poles or perches		1 Furlong
8 Furlongs		1 Engliſh mile

And therefore,

Mile. furl. poles. yards. feet. inches. barley corns.

1——8——40——5½——3—— 12——— 3

1——8—320—1760—5280—63360—190080
1— 40— 220— 660— 7920— 23760
1—— 5½— 16½— 198 ——594
1—— 3—— 36 ——108
1—— 12—— 36
1———3

And note, that the yard, as well as the ell, is uſually divided into 4 quarters, and each quarter into 4 nails.

Note alſo, that a geometrical pace is 5 feet; and there are 1056 ſuch paces in an *Engliſh* mile.

The parts of the ſuperficial meaſures of land, are ſuch as are mentioned in the following table, *viz.*

A table of land meaſure.

40 Square poles or perches	Make	1 Rood or quarter of an acre
4 Roods	Make	1 Acre

By the foregoing table of long meaſure, you are informed what a pole, or, which is all one, a perch, is; and by this, that 40 ſquare perches is a rood Now, a ſquare perch is a ſuperficies very aptly reſembled by a ſquare trencher, every ſide thereof being a perch of $5\frac{1}{2}$ yards in length, 40 of them is a rood, and 4 roods an acre: ſo that a ſuperficies that is 40 perches long and 4 broad is an acre of land, the acre containing in all 160 ſquare perches.

The leaſt denominative part of time is 1 minute, the greateſt integer being a year; from whence is produced this following table.

The table of time.

60 Minutes	Make	1 Hour
24 Hours	Make	1 Day natural
7 Days	Make	1 Week
4 Weeks	Make	1 Month
13 Months, 1 day, 6 hours	Make	1 Year

But the year is uſually divided into 12 unequal kalendar months; whoſe names, and the number of days they contain follow, *viz.*

	Days.
January	31
February	28
March	31
April	30
May	31
June	30
July	31
Auguſt	31
September	30
October	31
November	30
December	31
	365

So that the year containeth 365 days and 6 hours; but the 6 hours are not reckoned, but only every 4th year, and then there is a day added to the latter end of *February*, and then it containeth 29 days, and that year is called *leap year*, and containeth 366 days.

And here note, that as the hour is divided into 60 minutes, ſo each minute is ſubdivided into 60 ſeconds, and each ſecond into 60 thirds, and each third into 60 fourths, *&c.*

The trophical year, by the exacteſt obſervation of the moſt accurate aſtronomers, is found to be 365 days, 5 hours, 49 minutes, 4 ſeconds, and 21 thirds.

The following example will make this rule plain to the learner. Thus theſe following ſums being given to be added, *viz.* 136*l* 13*s* 4*d* 2*qrs* and 79*l* 7*s* 10*d* 3 *qrs.* and 33*l* 18*s* 9*d* 1 *qr*, and likewiſe 15*l* 6*s* 5*d* 0 *qrs*, the numbers being diſpoſed according to order will ſtand as in the margin. Then begin at the denomination of farthings, and add them up; ſaying 1 and 3 are 4, and 2 makes 6. Now, I conſider that 6 farthings are 1 penny and 2 farthings; wherefore I ſet down the 2 farthings in its place under the line, and keep 1 in mind to be added to the next denomination of pence. Then I go on, ſaying, 1 that I carried, and 5 are 6, and 9 are 15, and 10 are 25, and 4 are 29. Now I conſider, that 29 pence are 2 ſhillings and 5 pence; therefore I ſet the 5 pence in order under the line, and keep 2 in mind for 2 ſhillings, to be added to the ſhillings. Then I go on, ſaying, 2 that I carried and 9 are 11, and 18 are 29, and 7 are 36, and 13 are 49. Then I conſider that 49 ſhillings are 2 pounds and 9 ſhillings; wherefore I ſet the 9 ſhillings under the line, and carry 2 for the 2 pounds to the next and laſt denomination of pounds; and proceed, ſaying, 2 that I carried and 5 makes 7, and 3 are 10, and 9 are 19, and 6 are 25. Then I ſet down 5, and carry 2 for the 2 tens, and proceed; ſaying, 2 that I carried and 1 is 3, and 3 are 6, and 7 are 13, and 3 makes 16. And I ſet down 6, and carry 1 for the 10, and go on; ſaying, 1 that I carried and 1 are 2; which I ſet in its place under the line, and the work is finiſhed. And thus I find the ſum of the foreſaid numbers to be 265*l* 9*s* 5*d* 2 *qrs*. This to the ingenious practitioner is ſufficient. But I ſhall, for the further illuminating of the weaker appre-

l.	*s.*	*d.*	*qrs.*
136	13	4	2
79	7	10	3
33	18	9	1
15	9	5	0
265	9	5	2

henſions, explain the operation of another example in troy weight. And here the learner muſt take notice of the table of troy weight mentioned before. The numbers given in this example are, 38 *lb.* 7 *oz* 13 *p w* 18 *gr.* and 50 *lb* 10 *oz* 10 *p w* 12 *gr.* and 42 *lb* 8 *oz* 5 *p w* 16 *gr.* And, in order to the addition thereof, I place them as you ſee, and proceed to operation; ſaying, 16 and 12 are 28, and 18 are 46 Now, becauſe 24 grains make 1 penny weight. 46 grains are 1 penny weight, and 22 grains; wherefore I ſet down 22, and carry 1 for the penny weight; and going on, I ſay, 1 that I carry and 5 are 6, and 10 are 16, and 13 are 29; which is 1 ounce and 9 penny weight. I ſet down 9 in its place under the line, and carry 1 to the ounces; ſaying, 1 that I carry and 8 are 9, and 10 are 19, and 7 are 26 And becauſe 26 ounces make 2 pounds 2 ounces, I ſet down 2 for the ounces, and carry 2 to the pounds: going on, 2 that I carry and 2 are 4, and 8 makes 12; that is 2 and go 1: then 1 I carry and 4 are 5, and 5 are 10, and 3 makes 13; which I ſet down as in the margin, and the work is finiſhed: and I find the ſum of the ſaid numbers to amount to 132 *lb* 2 *oz* 9 *p w* 22 *gr.* This is ſufficient for the underſtanding of the following examples, or any other that ſhall come to thy view. The way of proving theſe, or any ſum in this rule, is ſhewed immediately after the enſuing examples.

lb.	*oz.*	*pw.*	*gr.*
38	7	13	18
50	10	10	12
42	8	5	16
132	2	9	22

Addition of troy weight.

lb.	*oz.*	*pw.*	*gr.*
15	7	13	12
18	6	4	20
11	10	16	18
9	4	10	22
19	11	18	4
22	0	0	0
97	5	4	4

lb.	*oz.*	*pw*	*gr.*
145	9	12	18
726	8	14	10
389	7	6	13
83	10	16	20
130	0	10	12
74	7	18	0
1550	8	19	1

Addition of apothecaries weight.

lb.	*oz.*	*dr.*	*sc.*	*gr.*
48	7	1	0	14
74	5	5	2	10
64	10	7	1	11
17	8	1	0	16
34	9	6	1	9
240	5	6	1	0

lb	*oz.*	*dr.*	*sc.*	*gr.*
60	3	4	0	10
48	10	6	0	14
34	8	2	1	15
18	11	2	2	11
160	7	1	2	15
35	2	5	1	7
358	7	7	0	12

Addition of avoirdupois weight.

Tuns	*C.*	*qrs.*	*lb.*
75	13	1	15
48	7	3	21
60	11	1	17
21	7	0	25
12	16	0	11
218	17	0	5

lb.	*oz.*	*dr*
36	10	12
22	11	13
11	7	4
15	4	10
20	10	9
106	13	0

Addition of liquid measure.

Tuns	*pipes*	*hhds.*	*gall.*
45	1	1	48
15	0	1	17
38	0	0	47
12	1	0	56
21	1	1	18
133	0	1	60

Tuns	*hhds.*	*gall.*	*pints*
30	3	40	4
12	0	28	6
47	5	60	5
57	3	22	2
17	0	0	0
168	1	26	2

Addition of dry measure.

Chald.	*qrs.*	*bush.*	*pec.*
48	3	7	3
13	1	4	0
54	0	6	2
16	3	6	1
40	1	0	1
173	3	0	3

Qrs	*bush.*	*pec.*	*gall.*
17	3	1	1
50	1	3	0
14	5	3	1
40	2	0	1
30	0	3	0
152	5	3	1

Addition of long meaſure.

Yards	*qrs*	*nails*	*Ells*	*qrs*	*nails*
35	3	3	56	1	3
14	1	2	13	3	2
74	2	3	48	2	1
38	0	1	50	1	0
30	1	0	74	0	2
15	0	0	17	1	0
208	1	1	260	0	0

Addition of land meaſure.

Acres	*roods*	*perches*	*Acres*	*roods*	*perches*
12	3	18	86	1	36
14	0	24	47	3	24
30	2	19	73	2	18
48	3	30	60	0	7
28	1	38	4	2	8
50	3	26	14	1	14
185	3	35	286	3	27

The proof of addition.

Addition is proved after this manner. When you have found out the ſum of the number given, then ſeparate the uppermoſt line from the reſt with a ſtroke or daſh of the pen, and then add them all up again as you did before, leaving out the uppermoſt line; and having ſo done, add the new-invented ſum to the uppermoſt line you ſeparated; and if the ſum of thoſe two lines be equal to the ſum firſt found out, then the work was performed true, otherways not. As for example: let us prove the firſt example of addition of money, whoſe ſum we found to be 265 *l* 9*s* 5*d* 2 *qrs*, and which we prove thus. Having ſeparated the uppermoſt number from the reſt by a line, as you ſee in the margin; then add the ſame together again, leaving out the ſaid uppermoſt line, and the ſum thereof I ſet under the firſt ſum

l.	*s.*	*d.*	*qrs.*
136	12	4	2
79	7	10	3
33	18	9	1
15	9	5	0
265	9	5	2
128	16	1	0
265	9	5	2

or true ſum, which doth amount to 128 *l.* 16 *s* 1 *d* 0 *qrs* then again I add this new ſum to the uppermoſt line that before was ſeparated from the reſt, and the ſum of thoſe two is 265*l* 9*s* 5 *d* 2 *qrs* the ſame with the firſt ſum; and therefore I conclude that the operation was rightly performed.

The main end of addition in queſtions reſolvable thereby, is to know the ſum of ſeveral debts, parcels, integers, &c. Some queſtions may be theſe that follow.

Queſt. 1. There was an old man whoſe age was required. To which he replied, I have ſeven ſons, each having two years between the birth of each other; and in the 44th year of my age my eldeſt ſon was born, which is now the age of the youngeſt. I demand, What was the old man's age?

Now, to reſolve this queſtion, firſt ſet down the father's age at the birth of the firſt child, which was 44; then the difference between the oldeſt and the youngeſt, which is 12 years; and then the age of the youngeſt, which is 44; and then add them all together; and their ſum is 100, the compleat age of the father.

	44
	12
	44
	100

Queſt. 2. A man lent his friend at ſeveral times theſe ſeveral ſums, *viz.* at one time 63 *l* at another time 50 *l* at another time 48 *l* at another time 156 *l.* Now I deſire to know how much he lent him in all?

Set the ſums lent under one another as you ſee in the margin; and then add them together, and you will find the ſum to amount to 317 *l.* which is the total of all the ſeveral ſums lent, and ſo much is due to the creditor.

	63
	50
	48
	156
	317

Queſt. 3. From *London* to *Ware* is 20 miles, thence to *Huntington* 29 miles, thence to *Stamford* 21 miles, thence to *Tuxford* 36 miles, thence to *Wentbridge* 25 miles, from thence to *York* 20 miles. Now I deſire to know how many miles it is from *London* to *York*, according to this reckoning?

Now, to anſwer this queſtion, ſet down the ſeveral diſtances given, as you ſee in the margin; and add them together, and you will find their ſum to amount to 251; which is the true diſtance in miles between *London* and *York*.

	20
	29
	21
	36
	25
	20
	152

Queſt. 4. There are two numbers, the leaſt whereof is 40, and the difference 14. I deſire to know what is the greater number, and alſo what is the ſum of both? Firſt ſet down the leaſt, *viz.* 40, and 14 the difference; and add them together, and the ſum is 54 for the greater number. Then I ſet 40 (the leaſt) under 54, (the greateſt), and add them together, and their ſum is 94, equal to the greateſt and leaſt numbers.

	40
	14
Greateſt	54
Leaſt	40
Sum	94

Of ſubtraction of whole numbers.

1. SUbtraction is the taking of a leſſer number out of a greater of like kind, whereby to find out a 3d number, being or declaring the inequality, exceſs or difference between the numbers given. Or, ſubtraction is that by which one number is taken out of another number given, to the end that the reſidue or remainder may be known; which remainder is alſo called the *reſt*, *remainder* or *difference* of the numbers given.

2. The number out of which ſubtraction is to be made, muſt be greater, or at leaſt equal with the other number given. The higher or ſuperior number is called the *major* number; and the lower or inferior is called the *minor* number; and the operation of ſubtraction being finiſhed, the reſt or remainder is called the *difference* of the numbers given.

3. In ſubtraction place the numbers given reſpectively the one under the other, in ſuch ſort as like degrees, places, or denominations, may ſtand in the ſame ſeries, *viz.* units under units, tens under tens, pounds under pounds, *&c.* feet under feet, and parts under parts,

&c. This being done, draw a line underneath, as in addition.

4. Having placed the numbers given as is before directed, and drawn in a line under them, ſubtract the lower number (which in this caſe muſt always be leſs than the uppermoſt) out of the higher number, and ſubſcribe the difference or remainder reſpectively below the line; and when the work is finiſhed, the number below the line, will give you the remainder.

As for example: let 364521 be given to be ſubtracted from 795836. I ſet the leſſer under the greater, as in the margin, and draw a line under them; then beginning at the right hand, I ſay, 1 out of 6 and there remains 5, which I ſet in order under the line. Then I proceed to the next, ſaying 2 from 3 reſts 1; which I note alſo under the line. And thus I go on till I have finiſhed the work. And then I find the *remainder* or *difference* to be 431315.

795836	
364521	
431315	

5. But if it ſo happen, as commonly it doth, that the lowermoſt number or figure is greater than the uppermoſt; then, in this caſe, add 10 to the uppermoſt number, and ſubtract the ſaid lowermoſt number from their ſum, and the remainder place under the line; and when you go to the next figure below, pay an unit, by adding it thereto for the 10 you borrowed before, and ſubtract that from the higher number of figures. And thus go on till your ſubtraction be finiſhed. As for example: Let 437503 be given, from whence it is required to ſubtract 153827. I diſpoſe of the numbers as is before directed, and as you ſee in the margin; then I begin, ſaying, 7 from 3 I cannot, but, adding 10 thereto, I ſay, 7 from 13, and there remains 6; which I ſet under the line in order. Then I proceed to the next figure, ſaying 1 that I borrowed and 2 is 3 from 0 I cannot, but 3 from 10, and there remains 7; which I likeways ſet down as before. Then 1 that I borrowed and 8 is 9 from 5 I cannot, but 9 from 15, and there remains 6. Then 1 I borrowed and 3 is 4 from 7, and there remains 3. Then 5 from 3 I cannot, but 5 from 13, and there remains 8. Then 1 borrowed and 1 are 2 from 4, and

437503	
153827	
283676	

there reſts 2. And thus the work is finiſhed. And after theſe numbers are ſubtracted one from another, the inequality, remainder, exceſs or difference, is found to be 283676. Examples for thy farther experience may be theſe that follow.

From	3469916	From	361576
Take	738642	Take	5864
Reſts	2731274	Reſts	355712

6. If the ſum or number to be ſubtracted is of ſeveral denominations, place the leſſer ſum below the greater, and in the ſame rank and order as is ſhewed in addition of the ſame numbers. Then begin at the right hand; and take the lower number out of the uppermoſt, if it be leſſer; but if it be bigger than the uppermoſt, then borrow an unit from the next greater denomination, and turn into the parts of the leſs denomination, and add thoſe parts to the uppermoſt, noting the remainder below the line. Then proceed, and pay 1 to the next denomination for that which you borrowed before; and proceed in this order, until the work be finiſhed. An example of this rule may be this that followeth. Let 375 *l* 13 *s* 7 *d* 1 *qr* be given, from whence let it be required to ſubtract 57 *l* 16 *s* 3 *d* 2 *qrs*. In order whereunto I place the numbers as you ſee in the margin. And thus I begin at the leaſt denomination, ſaying, 2 from 1 I cannot, therefore I borrow 1 penny from the next denomination, and turn it into farthings, which is 4; and adding 4 to 1, which is 5, I ſay, 2 from 5, and there remains 3; which I put under the line. Then going on, I ſay, 1 that I borrowed and 3 is 4 from 7, and there reſts 3. Then going on, I ſay, 16 from 13 I cannot, but borrowing 1 pound, and turning it into 20 ſhillings, I add it to 13, and that is 33, wherefore I ſay, 16 from 33, and there remains 17; which I ſet under the line; and go on, ſaying, 1 that I borrowed and 7 is 8 from 5 I cannot, but 8 from 15, and there remains 7; the 1 that I borrowed and 5 is 6

	l.	*s.*	*d.*	*qr.*
	375	13	7	1
	57	16	3	2
	317	17	3	3

from 7, there reſts 1, and 0 from 3 reſts 3. And I find the remainder or difference to be 317*l* 17*s* 3*d* 3*qrs*.

An example of troy weight may be this. I would ſubtract 17 *lb* 10 *oz* 11 *pw* 20 *gr* from 24 *lb* 5 *oz* 0 *pw* 8 *gr*. I place the numbers according to the rule; and begin, ſaying 20 from 8 I cannot, but borrow 1 penny weight, which is 24 grains, and add them to 8, and they are 32, wherefore I ſay, 20 from 22 reſts 12. Then 1 that I borrowed and 11 is 12 from 0 I cannot, but 12 from 20, borrowing an ounce, which is 20 penny weight, and there remains 8. Then 1 that I borrowed and 10 is 11 from 5 I cannot, but 11 from 17, and there reſts 6. Then 1 that I borrowed and 7 is 8 from 4 I cannot, but 8 from 14, and there reſts 6. Then 1 that I borrowed and 1 is 2 from 2, and there reſts nothing. So that I find the remainder or difference to be 6 *lb* 6 *oz* 8 *pw* 12 *gr*.

lb	*oz*	*pw*	*gr*
24	5	0	8
17	10	11	20
6	6	8	12

7. It many times happeneth, that you have many ſums or numbers to be ſubtracted from one number; as ſuppoſe a man ſhould lend his friend a certain ſum of money, and his friend hath paid him part of his debt at ſeveral times. Then before you can conveniently know what is ſtill owing, you are to add the ſeveral numbers or ſums of payments together, and ſubtract their ſum from the whole debt, and the remainder is the ſum due to the creditor. As ſuppoſe *A* lendeth to *B* 564*l* 16*s* 10*d* and *B* hath repaid him 79*l* 16*s* 8*d* at one time, and 163*l* 18*s* 11*d* at another time, and 241*l* 15*s* 8*d* at another time; and you would know how the accompt ſtandeth between them, or what more is due to *A*. In order whereunto I firſt ſet down the ſum which *A* lent, and draw a line underneath it; then under that line I ſet the ſeveral ſums of payments

	l	*s*	*d*
Lent -	564	16	10
Paid at ſeveral payments	79	16	8
	163	18	11
	241	15	8
Paid in all	485	11	3
Remains	79	5	7

as you ſee in the margin; and having brought the ſeveral ſums of payment into one total, I find their ſum amounteth to 485*l* 11*s* 3*d*, which I ſubtract from the ſum firſt lent by *A*, and I find the remainder to be 79 *l* 5 *s* 7 *d*, and ſo much is ſtill due to *A*.

When the learner hath good knowledge of what hath been already delivered, he will with eaſe underſtand the following examples.

Subtraction of money.

	l	*s*	*d*	*l*	*s*	*d*	*qrs*
Borrowed	374	10	3	700	10	11	1
Paid	97	15	11	9	3	11	2
Remains	276	14	4	691	6	11	3
Borrowed	1000	0	0	711	3	0	0
Paid	19	6	0	11	13	0	1
Remains due	980	19	6	699	9	11	3
Borrowed	-	-		3300	0	0	0
Paid at ſeveral payments				170	10	0	0
				360	13	10	1
				590	3	14	3
				74	4	11	3
Paid in all				1195	13	0	3
Remains due	-			2104	6	11	1

Subtraction of troy weight.

	lb	*oz*	*dr*	*gr*
Bought	174	0	13	0
Sold	78	4	16	15
Remains	95	7	16	9

	lb	oz	dr	gr
Bought	470	10	1	0
Sold at ſeveral times	60	0	0	0
	35	10	18	0
	16	7	9	8
	48	4	0	0
	61	11	19	23
	23	0	0	0
Sold in all	245	10	7	7
Remains unſold	224	11	13	17

Subtraction of apothecaries weight.

	lb	oz	dr	ſc	gr	lb	oz	dr	ſc	gr
Bought	12	4	3	0	0	20	0	1	0	7
Sold	8	5	1	1	15	10	0	1	2	12
Remains	3	11	1	4	5	9	11	7	0	15

Subtraction of avoirdupois weight.

	C	qrs	lb	T	C	qrs	lb	oz	dr
Bought	35	0	15	5	7	1	10	10	5
Sold	16	2	20	3	17	1	16	9	13
Remains	18	1	23	1	9	3	22	0	8

Subtraction of liquid meaſure.

	Tuns	hhds	gall	Tuns	hhds	gall	pints
Bought	40	1	30	60	3	42	4
Sold	16	1	40	15	0	46	6
Rem.	23	3	53	44	2	58	6

Subtraction of dry meaſure.

	Chal	qrs	buſh	pec	Chal	qrs	buſh	pec
Bt.	100	0	0	0	73	2	3	2
Sd.	54	1	4	3	46	2	3	3
Rem.	45	2	3	1	26	2	7	3

Subtraction of long meaſure.

	Yards	qrs	nails	Yards	qrs	nails
Bt.	160	0	0	344	0	1
Sold	95	1	2	177	0	3
Rem.	64	2	2	166	3	2

Subtraction of land meaſure.

	Acres	roods	perch	Acres	roods	perch
Bt.	140	2	13	600	0	0
Sold	70	3	12	54	0	16
Rem.	69	3	1	545	3	24

Proof of ſubtraction.

Sums in this rule are eaſily proved, by adding their remainders to their leſſer numbers; which (if right) will make the greater.

MULTIPLICATION.

MUltiplication may be accounted the moſt ſerviceable rule in arithmetic; it performeth the work of many additions in the moſt compendious manner, brings numbers of great denominations into ſmall, as pounds into ſhillings, pence, or farthings; tuns into hundreds, quarters, pounds, or ounces, *&c.* and by knowing the value of one thing, we find the value of many.

In multiplication obſerve theſe three terms, *multiplicand, multiplier, product.*

1. The multiplicand, (generally the greater of the two numbers) is the number to be multiplied.

2. The multiplier, (generally the leſſer of the two numbers) is the number to be multiplied with.

3. The product, is the reſult of the work, or the anſwer to the queſtion. But before any thing can be done

o the purpoſe, it is neceſſary to learn the following table perfect by heart.

The Multiplication Table.

3 times	3	9
	4	12
	5	15
	6	18
	7	21
	8	24
	9	27
4 times	4	16
	5	20
	6	24
	7	28
	8	32
	9	36
5 times	5	25
	6	30
	7	35
	8	40
	9	45
6 times	6	36
	7	42
	8	48
	9	45
7 times	7	49
	8	56
	9	63
8 times	8	64
	9	72
9 times	9	81
12 times	2	24
	3	36
	4	48
	5	60
	6	72
	7	84
	8	96
	9	108
	10	120
	11	132
	12	144

What is the amount of 3 *times* 654?

Anſwer, If you ſet the number 654, 3 times down on paper, one over another, the total will be 1962.

But ſuch queſtions are done by this rule of multiplication much readier, for being ſet down thus:

654 *Multiplicand*
3 *Multiplier*

Now to know how much 3 times 654 is, begin thus, ſaying, 3 times 4 is 12, the figure 2 of the 12, ſet below

the line, and bear the 10 of the 12 in mind, as 1; next, 3 times 5 is 15, and the 1 bore in mind, makes 16, ſo I ſet 6 below the line, and bear the ten in mind as one; next, I ſay, 3 time 6 is 18, and one bore in mind makes 19, which I ſet down, and the work will ſtand as in the margin.

654
3
1962

How many is 3 *times* 472? Set the figures down as in the margin; then ſay 3 times 2 is 6, which place under the 2 in the multiplicand; then 3 times 7 is 21; ſet down one under 7, and carry 2, for 2 tens, as in addition of one denomination; then 3 times 4 is 12, and 2 is 14; which I ſet down, and the product is 1416, that is 3 times 472 makes ſo much; and may be proved by *addition*, by ſetting down 472 three times in additional order, and caſting it up, which makes the aſſertion good in the ſecond definition, that this rule compendiouſly performs the office of addition. Likewiſe the foregoing examples agree with the firſt definition; for as 3 times 472 makes 1416, ſo doth 472 times 3 make the ſame number.

472
3
1416

Example. Again, *How many makes* 742 *multiplied by* 4?

742 *Multiplicand* 4 *Multiplier* 2968 *Product*	Here I ſay, 4 times 2 is 8, and 4 times 4 is 16; 6 and carry 1; and 4 times 7 is 28, and 1 is 29, which ſet down; ſo the whole product is 2968, as *per* example.

More examples of one figure in the *multiplier*, are theſe, *viz.*

Multiplicand	7420	4444	7468	90704	56789
Multiplier	5	6	7	8	9
Product	37100	26664	52276	725632	511101

In compound multiplication.

When the multiplier conſiſts of more figures than one, you muſt begin with that figure which is in the place of

units of the multiplier, and go thro' the whole multiplicand, by multiplying each figure of it firſt by that unit figure, then by the next, to wit, by the figure in the place of tens of the multiplier, then with the third, *&c.* to the laſt; always remembering to place the firſt figure of every product or line (for you will ever have as many as you have ſignificant figures in the multiplier) I ſay, remember to place the firſt figure of every line exactly and perpendicularly under the figure you multiply by: and then add the ſeveral lines or products together, which ſo collected, gives the total product required, as in the examples following, *viz.*

Example.

How many is, or are, 23 times 7426? Firſt, begin with the unit figure 3 in the multiplier, ſaying, 3 times 6 is 18; 8 (which I ſet directly under 3, by which I multiply) and carry one; then 3 times 2 is 6, and one is 7; then 3 times 4 is 12; 2 and carry one; then 3 times 7 is 21 and one is 22. And ſo I have done with the firſt figure of the multiplier, *viz.* 3. Then I go to the next, that is 2, and ſay, twice 6 is 12; 2 and carry one; (which 2 is placed in a direct line under 2 the multiplying figure) then twice 2 is 4 and one is 5; then twice 4 is 8; and laſtly twice 7 is 14, which I ſet down; then I add the two products together, ſaying, 8 is 8, *&c.* and the total is the right and proper product, or reſult of the multiplication, *viz.* 170798.

7426	
23	
22278	
14852	
170798	

527535	275827
15728	19725
4220280	1379135
1055070	551654
3692745	1930789
2637675	2482443
527535	275827
8297070480	5440687575

When cyphers are intermixt with figures in the multiplier then multiply by the figures as above; and when you come to a cypher in the multiplier, then ſet down another cypher exactly and perpendicularly under it; then begin the multiplicand again with the next figure to the cypher in the multiplier, and go through it in the ſame line, placing the firſt figure of that product next to the cypher towards the left hand, but then heed muſt be taken, that the next figure or cypher of the next line muſt be ſet down one degree farther towards the left-hand, and not immediately under the laſt figure ſet down next to the cypher: as in the following examples may be fully underſtood.

24393	7864371	327586
402	23604	6030
48786	31457484	9827580
975720	471862260	19655160
9805986	23593113	1975343580
	15728742	
	185630613084	

When you have a cypher or cyphers in the multiplier, at the beginning towards the right hand; then ſet it or them backwards from the place of units towards the right hand, and when you have multiplied by the figure or figures, annex the cypher or cyphers:

As in theſe examples.

4762	47962	4632
70	400	2600
333340	19184800	27792
		9264
		12043200

If you have cyphers in the units place, *&c.* both in the multiplicand and multiplier, then neglect the cy-

phers in both, and multiply by the figures, and annex as many cyphers to the total product as is the sum of the cyphers, both in multiplicand and multiplier.

As in these examples.

43600	42300	376400
220	12000	2400
852	846	15056
852	423	7528
9372000	507600000	903360000

When you are to multiply by 10, 100, 1000, or 10000, it is only adding or annexing so many cyphers to the multiplicand, as in the multiplier, that is, either 1, 2, 3, or 4 cyphers, and the work is done. *Example*, Suppose I am to multiply 375 by the numbers above; if I multiply it by 10, then I join 0 to 375, and then it makes, or the product is, 3750: if by 100, then I annex 00, and then it makes 37500: if by 1000, I put to it 000, and then it produces 375000: and lastly, if by 10000, I then add 0000, and then it makes 3750000, *&c.* And thus may any number be multiplied, when the multiplier consists of an unit with any number of cyphers.

Suppose you want to know how many half-crowns there are in 246 *l.* you know that 8 half crowns make a pound wherefore set them down thus:

246*l.*
Multiplied by 8 the half crowns in a pound.

Answer 1968 half crowns in all.

Again, In 1968 half crowns how many pence?
Multiply by 30 the pence in a half crown.

Answer 59040 pence in 1968 half crowns.

And this ſerves to make out, that great denominations are brought into ſmaller by this rule.

Admit you wanted to know the contents of a large table 34 feet long, and 4 feet wide.

Multiply 34 the length
by 4 the breadth, and the

Anſwer will be 136 ſquare feet for the true contents of ſuch a table.———

Multiplication of money.

Multiplication of money (what moſt would learn above every thing) hath great affinity with addition of money, the ſame method being taken in carrying one denomination to the next, *viz.* from farthings to pence, from pence to ſhillings, and from ſhillings to pounds. And as in addition, (and other multiplications) you begin at the right hand, and proceed towards the left; ſo here you begin at the leaſt denomination, which is alſo at the right hand.

This method of accompting is the moſt apt and expeditious of all others, for ſmaller quantities; and therefore extremely neceſſary in making bills of parcels, *&c.* And is beyond all contradiction, as ſure and certain as any way whatſoever.

The general rule,

Is always to multiply the price by the quantity.

The firſt ſtep is, for quantities from 2 to 12; and this is done by one multiplier; as in the following example:

Example 1. What muſt I give for 6 pieces of cloth, if one coſt 7 *l.* 12 *s.* 6 *d.*

	l.	*s.*	*d.*
	7	12	6
Multiply the price by			6
And the product is the anſwer, *viz.*	45	15	0

Here I ſay 6 times 6 is 36 pence, which is juſt 3*s*. I ſet down 0 in the place of pence, and carry 3*s*. to the place of ſhillings, exactly the ſame as in addition of money; then 6 times 12 is 72, and 3 is 75*s*. or 3*l*. 15*s*. wherefore I ſet down 15 in the place of ſhillings, and carry 3 to the pounds; then 6 times 7 is 42 and 3 is 45*l*. So the whole amount of the cloths, at 7*l*. 12*s*. 6*d*. *per* piece, is 45*l*. 15*s*. as in the work, and very conciſe.

Queſtions proper for this Rule.

Queſtion 1. What is the contents of a ſquare piece of ground, whoſe length is 28 perches, and breadth 13 perches?

Anſwer, 364 ſquare perches: for multiplying 28 the length by 13 the breadth, the product is ſo much.

Queſtion 2. There is a ſquare battle, whoſe flank is 47 men, and the files 19 deep; what number of men doth that battle contain? *Facit* 893: for multiplying 47 by 19, the product is 893.

Queſtion 3. If any one thing coſt 4 ſhillings, what ſhall 9 things coſt? *Anſwer*, 36 ſhillings: for multiply 4 by 9, the product is 36.

Queſtion 4. If a piece of money or merchandize be worth or coſt 17 ſhillings, what ſhall 19 ſuch pieces of money or merchandize coſt? *Facit* 323 ſhillings, which is equal to 16*l*. 3*s*.

Queſtion 5. If a ſoldier or ſervant get or ſpent 14*s*. *per* month, what is the wages or charges of 49 ſoldiers or ſervants for the ſame time? Multiply 49 by 14, the product is 686*s*. or 34*l*. 6*s*. for the anſwer.

Queſtions 6 If in a day there are 24 hours, how many hours are there in a year, accounting 365 days to conſtitute the year? *Facit* 8760 hours: to which if you add the 6 hours over and above 365 days, as there is in a year, then it will be 8766 hours. Now, if you multiply this 8766 by 60, you have the number of minutes in a year.

Diviſion of whole numbers.

1. DIviſion is the ſeparating or parting of any number or quantity given into any parts aſſigned; or to find how often one number is contained in another; or from any two numbers given to find a third that ſhall conſiſt of ſo many units, as the one of thoſe two given numbers is comprehended or contained in the other.

2. Diviſion hath three parts or numbers remarkable, *viz.* firſt the dividend: ſecondly, the diviſor; thirdly, the quotient. The dividend is the number given to be parted or divided. The diviſor is the number given by which the dividend is divided; or it is the number which ſheweth how many parts the dividend is to be divided into. And the quotient is the number produced by the diviſion of the two given numbers, the one by the other.

So 12 being given to be divided by 3, or into three equal parts, the quotient will be 4, for three is contained in 12 four times; where 12 is the dividend, and 3 is the diviſor, and 4 is the quotient.

3. In diviſion ſet down your dividend, and draw a crooked line at each end of it; and before the line at the left hand place the diviſor, and behind that on the right hand place the figures of the quotient, as in the margin; where it is required to divide 12 by 3. Firſt, I ſet down 12 the dividend, and on each ſide of it do I draw a crooked line, and before that on the left hand do I place 3 the diviſor. Then do I ſeek how often 3 is contained in 12; and becauſe I find it 4 times, I put 4 behind the crooked line on the right hand of the dividend, denoting the quotient.

3) 12 (4

4. But if, when the diviſor is a ſingle figure, the dividend conſiſteth of two or more places; then, having placed them for the work, as is before directed, put a point under the firſt figure on the left hand of the dividend, provided it be bigger than, or equal to the diviſor; but if it be leſs than the diviſor, then put a point under the ſecond figure from the left hand of the dividend: which figures, as far as the point goeth from the left

hand, are to be reckoned by themſelves, as if they had no dependence upon the other part of the dividend, and, for diſtinction s ſake, may be called the *dividual*. Then aſk how often the diviſor is contained in the dividual, placing the anſwer in the quotient. Then multiply the diviſor by the figure that you placed in the quotient, and ſet the product thereof under your dividual. Then draw a line under the product, and ſubtract the ſaid product from the dividual, placing the remainder under the ſaid line. Then put a point under the next figure in the dividend on the right hand of that to which you put the point before, and draw it down, placing it on the right hand of the remainder which you found by ſubtraction, which remainder, with the ſaid figure annexed to it, ſhall be a new dividual. Then ſeek again how often the diviſor is contained in this new dividual, and put the anſwer in the quotient on the right hand of the figure which you put there before. Then multiply the diviſor by the laſt figure that you put in the quotient, and ſubſcribe the product under the dividual, and make ſubtraction, and to the remainder draw down the next figure from the grand dividend, (having firſt put a point under it,) and put it on the right hand of the remainder for a new dividual, as before, *&c.* and proceed thus till the work is finiſhed.

Obſerve this general rule in all kinds of diviſion.

Firſt, To ſeek how often the diviſor is contained in the dividual. Then, having put the anſwer i the quotient, multiply the diviſor thereby, and ſubtract the product from the dividual. An example or two will make the rule plain. Let it be required to divide 2184 by 6. I diſpoſe the numbers given as is before directed, and as you ſee in the margin, in order to the work.

Then, becauſe 6 the diviſor is more than 2 the firſt figure of the dividend, I put a point under 1 the ſecond figure, which makes 21 for the dividual. Then do I aſk how often 6 the diviſor is contained in 21, and becauſe I cannot have it more than 3 times, I put 3 in the quotient, and thereby do I multiply the diviſor (6) and the product is 18, which I ſet in order under the dividual, and ſub-

```
6)2184(3
```

```
6)2184(3
  18
  --
   3
```

tract it therefrom, and the remainder (3) I place in order under the line, as you ſee in the margin.

Then do I make a point under the next figure of the dividend, being 8, and draw it down, annexing it to the remainder 3; ſo I have 38 for a new dividual. Then do I ſeek how often 6 is contained in 38; and becauſe I cannot have it more than 6 times, I put 6 in the quotient; and thereby do I multiply the diviſor (6) and the product (36) I put under the dividual (38), and ſubtract it therefrom, and the remainder (2) I put under the line, as you ſee in the margin.

```
6) 2184 (36
   ..
   18
   --
   38
   36
   --
    2
```

Then do I put a point under the next (and laſt) figure of the dividend, (being 4), and draw it down to the remainder (4); and putting it on the right hand thereof, it maketh 24 for a new dividual. Then I ſeek how often 6 is contained in 24; and the anſwer is 4, which I put in the quotient, and multiply the diviſor (6) thereby, and the product (24) I put under the dividual (24), and ſubtract it therefrom, and the remainder is 0. And thus the work is finiſhed; and I find the quotient to be 364; that is 6 is contained in 2184 juſt 364 times, or 2184 being divided into 6 equal parts, 364 is one of thoſe parts.

```
6)2184(364
  ...
  18
  --
  38
  36
  --
  24
  24
  --
  (0)
```

Again, if it were required to divide 2646 by 7, or into 7 equal parts, the quotient will be found to be 378; as appeareth by the operation on the margin.

```
7) 2646 (378
   ...
   21
   --
   54
   49
   --
   56
   56
   --
   (0)
```

So if it were required to divide 946 by 8, the quotient will be found to be 118, and 2 remaining after diviſion is ended. The work appeareth on the margin.

```
8) 946 (118
   ...
   8
  ---
  14
   8
  ---
   66
   64
  ---
   (2)
```

Many times the dividend cannot exactly be divided by the diviſor, but ſomething will remain; as in the laſt example; where 946 was given to be divided by 8, the quotient was 118, and there remaineth 2 after the diviſion is ended. Now what is to be done in this caſe with the remainder, the learner ſhall be taught when we come to treat of the reducing (or reduction) of fractions.

And here note, that if, after your diviſion is ended, any thing do remain, it muſt be leſs than your diviſor; for otherwiſe your work is not rightly performed.

Other examples are as follow.

```
8) 73464 (9183
   ....
   72
  ---
   14
    8
  ---
   66
   64
  ---
    24
    24
  ---
    (0)
```

```
9) 13758 (1528
   ....
   9
  ---
   47
   45
  ---
    25
    18
  ---
    73
    72
  ---
    (6)
```

5. But if the diviſor conſiſteth of more places than one, then chuſe ſo many figures from the left ſide of the dividend for a dividual as there are figures in the diviſor; and put a point under the fartheſt figure of that dividual to the right hand, and ſeek how often the firſt figure on the left ſide of the diviſor is contained in the firſt figure on the left ſide of the dividual, and place the anſwer in the quotient, and thereby multiply your diviſor, placing your product under your dividual, and ſubtract it therefrom, placing the remainder below the line. Then put a point under the next figure in the dividend, and draw it down to the ſaid remainder and annex it on the right ſide thereof, which makes a new dividual; and proceed as before, till the work is finiſhed.

And if it ſo happen, that, after you have choſen your firſt dividual as is before directed, you find it to be leſs than the diviſor; then put a point under the figure more near to the right hand, and ſeek how often the firſt figure on the left ſide of the diviſor is contained in the two firſt figures on the left ſide of the dividual, and place the anſwer in the quotient; by which multiply the diviſor, and place the product thereof in order under the dividual, and ſubtract it therefrom, and then proceed as before.

Always remembering, that in all caſes of diviſion, if, after you have multiplied your diviſor by the figure firſt placed in the quotient, the product be greater than the dividual, then you muſt cancel that figure in the quotient, and, inſtead thereof, put a figure leſs by an unit, (or one) and multiply the diviſor thereby: and if ſtill the product be greater than the dividual, make the figure in the quotient leſs by an unit. And thus do, until your product be leſs than the dividual, or at the moſt equal thereto, and then make ſubtraction. *&c.*

So, if you would divide 9464 by 24, the quotient will be found to be 394. I firſt put down the given number, as is before directed in the third rule. Now, becauſe my diviſor conſiſteth of two figures, I therefore put a point under my ſecond figure from the left hand of my dividend, which is 4; wherefore I ſeek how often 2 (the firſt fi-

```
                3
24)9464(
       72   4
       --
       22
```

gure on the left ſide of the diviſor is contained in 9, (the like firſt in the dividual); the anſwer is 4; which I put in the quotient, and thereby multiply all the diviſor, and find the product to be 96, which is greater than the dividual; wherefore I cancel the 4 in the quotient, and, inſtead thereof, I put 3 (an unit leſs) and by it multiply the diviſor 24, and the product is 72; which I ſubtract from 94 the dividual, and the remainder is 22. Then do I make a point under the next figure 6 in the dividend, and draw it down, and place it on the right ſide of the remainder 22, and it makes 226 for a new dividual. Now, becauſe the dividual 226 conſiſteth of a figure more than the diviſor, therefore I ſeek how often 2 (the figure of the diviſor) is contained in 22, the two firſt of the dividual: I ſay 9 times: wherefore I put 9 in the quotient, and thereby multiply the diviſor 24; the product (216) I place under the dividual 226, and ſubtract from it, and there remaineth 10.

```
24) 9464 (39
    ...
    72
   ----
   226
   216
   ----
    10
```

Then I go on, and make a point under the next and laſt figure (4) in the dividend, and draw it down to the remainder 10, and it makes 104 for a new dividual: which is alſo a figure more than the diviſor; and therefore I ſeek how often 2 is contained in 10: I anſwer 5 times. But multiplying my diviſor by 5, the product is 120; which is greater than the dividual: and therefore I make it but 4: and by it multiply the diviſor, and the product is 96, which being placed under, and ſubtracted from the dividual, there remaineth 8. And thus the whole work of diviſion is ended; and I find, that 9464 being divided by 24, or into 24 equal parts, is found to be 394, as was ſaid before, and the remainder is 8; as you ſee in the work on the margin.

```
24) 9464 (394
    ...;
    72
   ----
   226
   216
   ----
   104
    96
   ----
   (8)
```

Another example may be this. Let there be required the quotient of 1183653 divided by 385. Firſt I diſpoſe of the numbers in order to their dividing; and be-

cauſe 118, the three firſt figures of the dividend, is leſs than the diviſor 385, I therefore make a point under the fourth figure, which is 3, and ſee how often 3 (the firſt figure of the diviſor) is contained in 1: the anſwer is 3, which I put in the quotient, and thereby multiply the diviſor 385, and the product is 1155, which I ſubtract from the dividual 1183, and there remains 28. Then (as before) draw down the next figure, which is 6, and place it before the remainder 28: ſo have I 286 for a new dividual: and becauſe it hath no more figures than the diviſor, I ſeek how often 3 (the firſt figure in the diviſor) is contained in 2 (the firſt figure of the dividual) and the anſwer is 0; for a greater number cannot be contained in a leſſer; wherefore I put 0 in the quotient: and thereby (according to the 5th rule) I ſhould multiply my diviſor; but if I do, the product will be 0; and 0 ſubtracted from the dividual 286, the remainder is the ſame. Wherefore I draw down the next figure (5) from the dividend, and put it before the ſaid remainder 286: ſo have I 2865 for a new dividual; and becauſe it conſiſteth of four places, *viz.* a place more than the diviſor, I ſeek how often 3 (the firſt figure of the diviſor) is contained in 28 (the two firſt of the dividual) and I ſay, there is 9 times 3 in 28; but multiplying the whole diviſor (385) thereby, I find the product to be 3465, which is greater than the dividual 2865: wherefore I chuſe 8, which is leſs by an unit than 9; and thereby I multiply the diviſor 385, and the product is 3080, which ſtill is greater than the ſaid dividual: wherefore I chuſe another number yet an unit leſs, *viz.* 7, and having multiplied my diviſor thereby, the product is 2695; which is leſs than the dividual 2865; wherefore I put 7 in the quotient, and ſubtract 2695 from the

```
385) 1183653 (3
     1155
     ----
       28

385)1183653(30
    ..
    1155
    ----
     286

385)1183653(307
   ...
   1155
   ----
   2865
   2695
   ----
    170
```

dividual 2865, and there remains 170. Then I draw down the laſt figure (3) in the dividend, and place it before the ſaid remainder 170, and it makes 1703 for a new dividual. Then (for the reaſon above ſaid) I ſeek how often 3 is contained in 17: the anſwer is 5, by multiplying the diviſor thereby, the product is 1925 greater than the dividual; wherefore I ſay it will bear 4, an unit leſs, and by it I multiply the diviſor 385; and the product is 1540, which is leſs than the dividual, and therefore I put 4 in the quotient, and ſubtract the ſaid product from the dividual, and there remaineth 163. And thus the work is finiſhed; and I find that 1183653 being divided by 385, or in 385 equal ſhares or parts, the quotient, or one of thoſe parts, is 3074, and beſides there is 163 remaining.

```
385)1183653(3074
    ....
    1155
    ----
    2865
    2695
    ----
    1703
    1540
    ----
    (163)
```

And thus the learner being well verſed in the method of the foregoing examples, may be ſufficiently qualified for the dividing of any greater ſum or number, into as many parts as he pleaſeth; that is, he may underſtand the method of dividing by a diviſor that conſiſteth of 4, or 5 or 6, or any greater number of places; the method being the ſame with the foregoing examples in every reſpect.

Other examples in diviſion.

```
27986 )835684790(29860
      ....
      55972
      -----
      279964
      251874
      ------
      240907
      223888
      ------
      170199
      167916
      ------
Remains 22830
```

```
196374)473986018(2413
       ....
       392748
       ------
       812380
       785496
       ------
       268841
       196374
       ------
       724678
       589122
       ------
Remains 135556
```

So if you divide 47386473 by 58736, you will find the quotient to be 806, and 45257 will remain after the work is ended.

In like manner, if you would divide 3846792 04 by 483064, the quotient will be 7963, and the remainder after diviſion will be 100572.

When the diviſor is 3, 4, 5, 6, or more figures, there is a ſure and eaſy way of performing the work truly, by making a table of the diviſor, which may be done by addition, or multiplying the diviſor by 2, 3, 4, *&c.*

Admit you are to divide 987654321 by 123456

```
123456) 987654321 (8000
        987648...
        --------
           6321
        --------
```

Here having noted the number of figures in the diviſor, which here is ſix, I make a point under the ſeventh figure, or place of the dividend, *&c.*

1	123456
2	246912
3	370368
4	493824
5	617280
6	740736
7	864192
8	987648
9	1111104

This table is made by doubling the firſt line, which is 246912, *which added to the firſt or uppermoſt line gives the third line* 370368, *which alſo added to the ſaid firſt line makes* 493824 *for the fourth line or product; and ſo of the reſt, ſtill remembering to add the ſubſequent line, till you come the laſt line of* 9 *times, which is* 1111104. *The truth of which may be proved by multiplying the firſt or uppermoſt line by* 2, 3, 4, 5, &c. *and if you commit an error by addition it may be found out, or corrected by multiplication.*

The uſe of the ſaid table.

When you have pointed out your number of places in the dividend, caſt your eye on the table, and at the firſt view you may know how many times you can take; as in this example, 7 times is too little, and 9 times to much, wherefore I ſet down 8 in the quotient, and then multiply and ſubtract, and the remainder is 6; to which I bring down 3, and put 0 in the quotient, then to the 63 I bring down 2 and place another 0 in the quotient, then to 632 I bring down 1, the laſt figure of the dividend, but ſtill it will not bear any time or times, wherefore I put another 0 in the quotient, and ſo the work is done, and the quotient is 8000, and the remainder 6321. as in the work.

Abbreviations.

(1ſt.) *If there are any cyphers on the right hand of your diviſor, you may cut off ſo many cyphers, or figures, on the right hand of your dividend. but remember to bring them down (if figures) to the remainder.*

Example.

21100)86451.9(411
84

24
21

35
21

1429

(2dly.) *By the foregoing rule you may obſerve, that to divide by* 10, 100, 1000, &c. *is only to cut ſo many figures from the right hand of the dividend, as there are cyphers in the diviſor.*

Example.

11000)43682|1735)

So the quotient is 43682, the remainder 735.

(3dly.) *When your diviſor is* 12, *or conſiſts only of one ſingle figure, or can be reduced to one by cutting*

off cyphers from its right hand, the work may be eaſily performed in one line, thus:

Rule.

Drawing a line under the dividend, ſet down under its firſt figure, how often the diviſor is contained in it: what remains imagine placed before the next figure, and, conſidering how often your diviſor is contained in the ſum it makes, ſet down the number underneath, as before, and ſo proceed through all the figures, ſet down what remains at laſt, in the place where your quotient uſed to ſtand.

Examples.

4)93645(1	12)82675(11	7100)5635115)
23411	6972	805

If you are to divide ſeveral numbers by one common diviſor (as in the calculating of tables, &c.) that you may know exactly at once how often your diviſor will go, in ſome convenient corner make a table of your diviſor, by multiplying it ſeverally by all the nine digits; thus, ſuppoſe 562 your diviſor:

562	1
1124	2
1686	3
2248	4
2810	5
3372	6
3934	7
4496	8
5058	9

Proofs of Diviſion.

(1ſt): *Multiplication and diviſion mutually prove each other: for as if you divide the product of a multiplication by the multiplier, the quotient will be the multiplicand; ſo, if you multiply the quotient of a diviſion by the diviſor (taking in the remainder) the product will be the dividend.*

(2dly) *Another proof of diviſion is, by adding together thoſe lines in the following example, marked with aſteriſms (being the particular products of the diviſor, multiplied ſeverally by each figure in the quotient, together with the remainder of the diviſion) the total of which (if right) will be the dividend.*

(3dly.) *Diviſion may alſo be proved as multiplication, by a croſs, thus; caſting out the nines from the diviſor and quotient, place the remainders on its right and left ſides, then multiplying the two figures ſo placed together and caſting the nines from the product, and what's left to the remainder of the diviſion, and ſtill caſting out the nines, let the overplus be placed at the top; then alſo caſting the nines from the dividend, ſet down the figure remaining at the bottom, which if it agrees with that at top, the work may be ſuppoſed right. See each proof in the following*

Example.

736)863256(1172

736*

1272

736*

5365

5152*

2136

1472*

664*

863256 2d Proof

736

7032

3516

8204

862592

664 Remainder

863256 1ſt Proof.

3 / 7 — 2 / 3 — 3d Proof

REDUCTION.

1. REduction is that which brings together two or more numbers of different denominations into one denomination; or it ſerveth to change or alter numbers, money, weight, meaſure, or time, from one denomination to another; and likewiſe to abridge fractions to the loweſt terms; all which it doth ſo preciſely, that

the firſt proportion remaineth without the leaſt jot of error or wrong committed: ſo that it belongeth as well to fractions as integers; of which in its proper place. Reduction is generally performed either by multiplication or diviſion. From whence we may gather, That,

2. Reduction is either deſcending or aſcending.

3. Reduction deſcending is, when it is required to reduce a ſum or number of a greater denomination into a leſſer, which number, when it is ſo reduced, ſhall be equal in value to the number firſt given in the greater denomination: as if it were required to know how many ſhillings, pence, or farthings, are equal in value to an hundred pounds? or, how many ounces, are contained in 45 hundred weight? or how many days, hours, or minutes, there are in 240 years? *&c.* And this kind of reduction is generally performed by multiplication.

4 Reduction aſcending is, when it is required to reduce or bring a ſum or number of a ſmaller denomination into a greater, which ſhall be equivalent to the given number; as ſuppoſe it were required to find how many pence ſhillings or pounds, are equal in value to 43785 farthings? or how many hundreds are equal to (or in) 3748 pounds, *&c.* And this kind of reduction is always performed by diviſion.

6. When any ſum or number is given to be reduced into another denomination, you are to conſider whether it ought to be reſolved by the rule deſcending or aſcending, *viz.* by multiplication, or diviſion. If it be to be performed by multiplication, conſider how many parts of the denomination into which you would reduce it, are contained in an unit or integer of the given number, and multiply the ſaid given number thereby, and the product thereof will be the anſwer to the queſtion. As, if the queſtion were, In 38 pounds how many ſhillings, here I conſider, that in one pound are 20 ſhillings, and that the number of ſhillings in 38 pounds, will be 20 times 38; wherefore I multiply 38*l.* by 20, and the product is 760, and ſo many ſhillings are contained in 38 *l.* as in the margin.

	38
	20
	760

But when there is a denomination or denominations between the number given and the number required,

you may, if you pleaſe, reduce it to the next inferior denomination, and then into the next lower than that, *&c.* until you have brought it into the denomination required. As for example; let it be demanded, In 132 pounds how many farthings? First, I multiply 132 (the number of pounds given) by 20 to bring it into ſhillings, and it makes 2640 ſhillings. Then do I multiply the ſhillings 2640 by 12 to bring them into pence, and it produceth 31680, and ſo many pence are contained in 2640 ſhillings, or 132 pounds. Then do I multiply the pence, *viz.* 31680 by 4, to bring them into farthings, (becauſe 4 farthings is a penny) and I find the product thereof to be 126720, and ſo many farthings are equal in value to 132 pounds. The work is manifeſt in the margin.

132 pounds	
20	
2640 ſhillings	
12	
5280	
2640	
31680 pence	
4	
126720 farthings	

6. And if the number propounded to be reduced is to be divided, or wrought by the rule aſcending, conſider how many of the given numbers are equal to an unit or integer in that denomination to which you would reduce your given number, and make that your diviſor, and the given number your dividend; and the quotient thence ariſing will be the number ſought or required. As for example; let it be required to reduce 2640 ſhillings into pounds. Here I conſider that 20 ſhillings are equal to one pound; wherefore I divide 2640, the given number, by 20, and the quotient is 132, and ſo many pounds are contained in 2640 ſhillings. In reduction deſcending and aſcending, the learner is adviſed to take particular notice of the tables delivered in the former part of this book, where he may be informed what multipliers or diviſors to make uſe of in the reducing of any number to any a-

		l.
20)	2640	(132
	2	
	6	
	6	
	4	
	4	
	(0)	

ther denomination whatſoever, eſpecially Engliſh monies, weights, meaſures, time, and motion. But in this place it is not convenient to meddle with foreign coins, weights, or meaſures.

But if in reduction aſcending it happen that there is a denomination, or denominations between the number given and the number required, then you may reduce your number given into the next ſuperior denomination, and when it is ſo reduced, bring it into the next above that, and ſo on, until you have brought it into the denomination required. As for example;

Let it be demanded, In 126720 farthings how many pounds? Firſt I divide my given number, being farthings, by 4, to bring them into pence, becauſe 4 farthings make one penny; and there are 31680 pence. Then I divide 31680 pence by 12, and the quotient giveth 2640 ſhillings. And then I divide 2640 ſhillings by 20, and the quotient giveth 132*l.* which are equal in value to 126720 farthings. See the work.

4 (126720	12) (31680	20) (2640	*l.* (132
12	24	2	
6	76	6	
4	72	6	
27	48	4	
24	48	4	
32	(0)	(0)	
32			
(0)			

7. When the number given to be reduced, conſiſteth of divers denominations, as pounds, ſhillings, pence, and farthings, or of hundreds, quarters, pounds, and ounces, *&c.* then you are to reduce the higheſt, or greateſt, denomination into the next inferior, and add thereunto the number ſtanding in that denomination, which your greateſt or higheſt number is reduced to. Then reduce

that ſum into the next inferior denomination, adding thereto the number ſtanding in that denomination. Do ſo until you have brought the number given into the denomination propoſed. As, if it were required to reduce 48*l.* 13*s.* 10*d.* into pence: firſt I bring 48*l.* into ſhillings, by multiplying it by 20, and the product is 960 ſhillings; to which I add the 13 ſhillings, and they make 973. Then I multiply 973 by 12, to bring the ſhillings into pence, and they make 11676; to which I add the 10 pence, and they make 11686 pence for the anſwer. See the work done.

	l.	*s.*	*d.*
	48	13	10
	20		
	960 ſhillings		
Add	13		
Sum	973 ſhillings		
	12		
	1946		
	973		
	11676 pence		
Add	10		
Sum	11686 pence		

8. If in reduction aſcending, after diviſion is ended, any thing remain, ſuch remainder is of the ſame denomination with the dividend.

Example. In 4783 farthings; I demand how many pounds? View the following operation.

First, I divide the given number of farthings (*viz.* 4783) by 4, to bring them into pence, and the quotient is 1195 pence; and there remaineth 3 after the work of diviſion is ended, which is 3 farthings.

Again, I divide 1195 pence (the ſaid quotient) by 12, to reduce them

4) 4783	12) 1195	20) 99	(4 pounds
4	108	8	
7	115	19 ſhillings	
4	108		
38	Rem. 7 pence		
36			
23	*Facit* 4—19—7—3		
20			
Rem. 3 farthings			

into ſhillings, and the quotient is 99 ſhillings; and there is a remainder of 7, which is 7 pence.

And then divide 99 ſhillings (the laſt quotient) by 20, to bring it into pounds, and the quotient is 4*l.* and there remaineth 19 ſhillings; ſo that I conclude that in 4783 (the propoſed number of farthings) there is 4 pounds, 19 ſhillings, 7 pence 3 farthings.

More examples in reduction of coin.

Queſt. *In* 4381. *how many ſhillings?* *Facit* 8760 ſhillings; for multiplying 438 by 20, the product amounteth to ſo much. See the work.

438 pounds
20
Facit 8760 ſhillings

Queſt. *In* 467 l. *how many pence?* Firſt multiply the given number of pounds (467) by 20, to bring it into ſhillings; and it makes 9340 ſhillings; then multiply the ſhillings by 12, and it produceth 112080 pence, thus.

467 pounds
20
9340 ſhillings
12
1868
934
Facit 112080 pence

Or it may be reſolved thus, *viz* Multiply the given number of pounds (467) by (240) the number of pence in a pound, and the product is the ſame, *viz.* 112080 pence; as by the operation appeareth.

467 pounds
240
1868
934
Facit 112080 pence

Queſt. *In* 5673 l. *how many farthings?* Firſt multiply the given number by 20, to bring it into ſhillings, and it produceth 113460 ſhillings; then multiply that product by 12, to bring it into pence, and it produceth 1361520 pence; then, laſtly, multiply the pence by 4, and it produceth 5446080 farthings. See the operation.

5673 pounds
20
113460 ſhillings
12
22692
11346
1361520 pence
4
Facit 5446080 farthings

Or this queſtion might have been thus reſolved, *viz.* Multiply 5673 (the given number of pounds) by 960 (the number of farthings in a pound), and it produceth the ſame effect; as you ſee by the work.

5 73 pounds
960
34038
51057
Facit 5446080 farthings

20 ſhillings
12
240 pence
4
960 farthings

Otherwiſe thus: Firſt, bring the given number 5673*l.* into ſhillings, and multiply the ſhillings by 48, the number of farthings in a ſhilling, and the ſame effect is thereby likewiſe produced, *viz.*

5673 pounds
20
113460 ſhillings
48
90768
45384
Facit 5446080 farthings

12 pence
4
48 farthings

These various ways of operation are expreſſed to inform the judgment of the learner with the reaſon of the rule. More ways may be ſhewn, but theſe are ſufficient even for the meaneſt capacities.

Queſt. *In* 458 l. 16 s. 7 d. 3 qrs. *how many farthings?* To reſolve this queſtion, conſider the ſeventh rule, and work as you are there directed, and you will find the foreſaid given numbers to amount to 440479 farthings, *viz.*

	l.	*s.*	*d.*	*qrs.*
	458	—16	—7	—3
	20			
	9 60			
Add	16 ſhillings			
Sum	9176 ſhillings			
	12			
	18352			
	9176			
	110112			
Add	7 pence			
Sum	110119 pence			
	4			
	440476			
Add	3 farthings			
Sum	440479 farthings			

This laſt queſtion, or any other of this kind, *viz* where the number given to be reduced conſiſteth of ſeveral denominations, may be more conciſely reſolved thus, *viz.* When you multiply the pounds by 20, to bring them into ſhillings, to the product of the firſt figure add the figure ſtanding in the place of units in the denomination of ſhillings; but becauſe the firſt figure in the

	l.	*s.*	*d*	*qrs.*
	458	—16	—7	—3
	20			
	9176 ſhillings			
	12			
	18359			
	9176			
	110119 pence			
	4			
Facit	440479 farthings			

multiplier is 0, I ſay, 0 times 8 is nothing, but 6 is 6, which I put down for the firſt figure in the product. Then becauſe the multiplier is 0, I go no further with it, for if I ſhould, the whole product would be 0; but proceed. And when I come to multiply by the ſecond figure in the multiplier, to the product of it I add the figure ſtanding in the place of tens in the denomination of ſhillings, which is 1; ſaying, 2 times 8 is 16, and (the ſaid figure) 17. Then I ſet down 7, and carry the unit to the product of the next figure, as has been directed before. So that now you may have the whole product and ſum of ſhillings at one operation, which is the ſame as before. And when you multiply the ſhillings by 12, to bring them into pence, after the ſame manner, add to the product the number ſtanding in the denomination of pence; and ſo when you multiply the pence by 4, to bring them into farthings, add to the product the number ſtanding under the denomination of farthings. See the laſt queſtion thus wrought on the margin of the preceeding page.

Reduction of troy weight.

We now come to give the learner ſome examples in troy weight; wherein we ſhall be brief, having given ſo large a taſte of reduction in the former examples of coin. And now the learner muſt be mindful of the table of troy weight delivered in addition.

Queſt. *In* 482 *lb.* 7 *oz.* 13 *pw.* 21 *gr. how many grains?*

Multiply by 12, by 20, and by 24, taking in the figures ſtanding in the ſeveral denominations, according to the directions, given formerly and you will find the product to be 1780013 grains, which is the number required, or anſwer to the queſtion. See the whole work as followeth.

l. oz. pw. gr.
482—7—13—21
12

971
482

5791 ounces
20

115833 penny wt.
24

463332
231668

Facit 2780013

Queſt. *In* 2780013 *grains, I demand how many pounds, ounces, penny weights, and grains?*

This is but the foregoing queſtion inverted, and is reſolved by dividing by 24 by 20, and by 12; and the anſwer is 482 lb. 7 oz. 13 pw. 21 gr.

24)2780013	20)1158313	12)5791	(482
24	10	48	
38	15	99	
24	14	96	
140	18	31	
120	18	24	
200	3	Rem. 7 ounces	
192	2		
81	Rem. 13 penny weight		
72			
93	*l. oz. pw. gr.*		
72	*Facit* 482—7—13—21		

Remains 21 grains.

Reduction of avoirdupois weight.

In reducing of avoirdupois weight, the learner muſt have recourſe to the table of avoirdupois weight delivered before.

Queſt. *In* 47 C. 1 qr. 20 lb. *How many ounce ?* Multiply by 4. by 28. and by 16; and the laſt product will be the anſwer, *viz.* 84992 ounces.

C. qr. lb.
47—1—20
4
189 quar.
28
1512
380
5312
16
32872
5312

Facit 84992 oz.

Queſt. *In* 84992 *ounces, I demand how many* C. qrs. lb. *and* oz. *?*

This is the foregoing queſtion inverted, and will be reſolved if you divide by 16, by 28, and by 4; and the anſwer is 47 *C.* 1 *qr* 20 *lb.* equal to the given number in the foregoing queſtion.

16)84992	28) (53 2	4) (189	*C. qrs. lb. oz.* (47—1—20—0
80	28	16	
49	251	29	
48	224	29	
19	272	1 qr.	
16	252		
32	20 pounds		
32			
(0)			

Reduction of liquid measure.

Queſt. *In* 45 *tuns of wine, how many gallons?* Multiply by 4, and 63; the product is 11340 gallons for the anſwer.

45
4

180
63

54
108

Facit 11340

Queſt. *In* 34 *rundlets of wine, each containing* 18 *gallons, I demand how many hogſheads?*

Firſt, find how many gallons are in the 34 rundlets, which you may do if you multiply 34 by 18, the content of a rundlet, and the product is 612 gallons, which you may reduce into hogſheads, if you divide them by 63, and the quote will be 9 hogſheads, and 45 gallons. See the work.

34
18

272
34
---
63)612(9 hhds.
567

Rem 45 gallons.

Facit 9 hdds. 45 gallons.

Queſt. In 12 tuns, how many rundlets of 14 gallons *per* rundlet?

Reduce your tuns into gallons, and divide them by 14, the gallons in a rundlet, and the quotient, 216, is your anſwer: See the work.

```
  12
   4
  ---
  48
  63
  ---
 144
 288
 ---
14) 3024 (216 rundlets
    ...
  28
  ---
  22
  14
  ---
   84
   84   Facit 216 rundlets
  ---
  (0)
```

Reduction of long meaſure.

Queſt I demand how many furlongs, poles, inches, and barley-corns will reach from *London* to *York*, it being accounted 151 miles.

151	miles
8	furlongs in a mile
1208	furlongs
40	poles in a furlong
48320	poles
11	half yards in a pole
4832	
4832	
531520	half-yards
18	inches in a half-yard
425216	
53152	
9567360	inches
3	barley-corns in an inch
Facit 28702080	

Queſt. The circumference of the earth (as all other circles are) is divided into 360 degrees, and each degree into 60 minutes, which, upon the ſuperficies of the earth, are equal to 60 miles; now I demand how many miles, furlongs, perches, yards, feet, and barley corns, will reach round the globe of the earth?

360 degrees
60 minutes or miles in a degree

21600 miles about the earth
8 furlongs in a mile

172800 furlongs about the earth
40 perches in a furlong

6912000 poles or perches about the earth
11 half-yards in a perch

6912
6912

2) 76032000 half-yards about the earth

(38016000 yards, *viz.* the half-yard divided
3 by 2

114048000 feet about the earth
12 inches in a foot

228096
114048

1368576000 inches about the earth
3 barley-corns in an inch

Facit 4105728000 barley-corns

And ſo many will reach round the world, the whole being 21600 miles. So that if any perſon were to go round, and go 15 miles every day, he would go the whole circumference in 1440 days, which is 3 years, 11 months and 15 days.

Reduction of time.

Queſt. In 28 years, 24 weeks, 4 days, 16 hours, 30 minutes, how many minutes?

Years, weeks, days, hours, minutes.
28——24——4——16——30
52 weeks in a year

60
142

1480 weeks
7

10364 days
24

41462
20729

248752 hours
60

14925150 minutes

Note, That in reſolving the laſt queſtion after the method expreſſed, there are loſt in every year 30 hours: for the year conſiſteth of 365 days and 6 hours; but by multiplying the year by 52 weeks, which is 364 days, you loſe 1 day and 6 hours every year. Wherefore, to find an exact anſwer, bring the odd weeks, days and hours, into hours, and then multiply the year by the number of hours in a year, *viz.* 8766, and to the product add the hours contained in the odd time, and you have the exact time in hours; which bring into minutes as before. Se the laſt queſtion thus reſolved.

	Days. hours.	*Weeks. days. hours.*
28	365——6	24——4— 16
8766	24	7
172	1466	172
172	730	24
197		
228	8766 hours in a year	694
		345
249592 hours		4144
60		

14975520 minutes in 28 years and 4144 hours

So you ſee, that, according to the method firſt uſed to reſolve this queſtion, the hours contained in the given time, are 248752; but according to the laſt, beſt, or trueſt method, they are 249592, which exceeds the former by 840 hours.

But for moſt occaſions it will be ſufficient to multiply the given years by 365; and to the product add the days in the odd time, if there be any, and then there will be only a loſs of ſix hours in every year; which may be ſupplied by taking a fourth part of the given years, and adding it to the contained days, and you have your deſire.

The Golden Rule; *or*, Rule of Three Direct

IS ſo called from its extraordinary uſefulneſs, not only in arithmetical queſtions, but in all parts of the mathematics.

It is alſo called *the rule of three*, becauſe there are always three numbers given to find out a fourth: and it is properly called *the rule of proportion*, becauſe the firſt number bears ſuch proportion to the ſecond, as the third does to the fourth.

The deſign of this rule is, to ſhew how to find a fourth proportional number, by having three given numbers, which is deducible from the *ſixteenth propoſition of the ſixth book of* Euclid's *elements*.

The Rule is,

Multiply the ſecond and third numbers together, and divide the product by the firſt number, and the quotient thence ariſing is the fourth number ſought. *Or,*

Divide the ſecond number by the firſt, and multiply the quotient by the third, and the product is the number required: for the fourth number contains the third ſo often as the ſecond contains the firſt. And this is called *direct proportion*.

All queſtions in this *rule of three* conſiſt of three numbers, whereof two are always of one kind or denomination. As in this example.

If I give 10s. *for* 5 *yards, what ſhall I give for* 15 *yards at the ſame rate?*

Now two of theſe are of the ſame kind, that is, the number 5 and 15, which are both yards, which place thus. The number, concerning which the queſtion is asked, muſt be in the third place.

Now in this queſtion the 15 yards is the number, and the price of which the queſtion requires the value, place it therefore in the third place.

Then ſeek out the other number of the ſame kind or denomination, which muſt be yards alſo, which in this queſtion is 5; ſet this in the firſt place, and then the other number, that is 10*s.* will conſequently claim the ſecond place, and the anſwer to the queſtion will be always of the ſame denomination with it, which here is ſhillings.

Now the queſtion ſtated according to the foregoing rules ſtands thus,

If 5 *yards coſt* 10s. *what will* 15 *yards coſt?*

15

5)150(30*s.* Anſwer

15

00

Multiply the ſecond number by the third, and divide the product by the firſt.

Note, That the three numbers are 5, 10, 15.

Proof of the laſt queſtion.

What ſhall I pay for 5 *yards, when* 15 *yards are ſold for* 30 *ſhillings?*

If 15 *yards coſt* 30s. *what will* 5 *yards coſt?*

5

15)150(10*s.* Anſwer

15

00

What is the intereſt of 75 *pounds at the rate of* 8 l. per cent. per annum?

The numbers will be ſtated thus:

L. P.	*L. I.*	*L. P.*
100	8	75

In this example there are two numbers that are principal money, and one that is intereſt; therefore the intereſt (according to the rule) muſt ſtand in the middle, or ſecond place; the principal on which the intereſt dependeth, *viz.* 100*l.* (8*l.* being the intereſt thereof) muſt ſtand in the firſt place towards the left-hand, and the other principal on which the fourth number (which is the number ſought for) dependeth, muſt poſſeſs the firſt place towards the right-hand.

By theſe rules foregoing, you may with eaſe and certainty perform any operation in direct proportion; and for your further information take the examples following.

Example. *If the intereſt of* 100 l. *for one year be* 8 l. *what is the intereſt of* 75 l. *for the ſame time?*

L. P.	*L. I.*	*L. P.*
100	8	75

1|00)6|00(6*l.* for anſwer.

Example. *If* 32 *rundlets of brandy coſt* 96l. *what will* 4 *rundlets coſt at that rate?*

Run.	*l.*	*Run.*
32	96	4

32)384(12*l.* Anſwer

64

0 Remains

Example. *If* 12 *bags of cotton wool coſt* 148*l. what will* 17 *bags coſt?*

Bags	*L.*	Bags
12	184	17
	17	
	1288	*l. s. d.*
	184	260 13 4 Anſwer
	3128	

12)3128(260*l.*

72

8 Pounds remain

20 Shillings multiply

160

12)160(13 Shillings

40

4 Shillings remain

12 Pence multiply

48

12)48(4 Pence

0 Remains

Note, That as in the laſt example, when any thing remains that is reducible to a lower denomination, after it is ſo reduced, it muſt be divided continually by the firſt number.

Caſe] When any of the three given numbers happen to be of divers denominations

Rule] You may reduce them into the loweſt denomination. And if your firſt number require to be reduced, your third muſt be reduced likewiſe into the ſame denomination as the firſt: for the firſt and third number before you begin your operation, muſt be always of one name or denomination.

Example *If* 17 *hogſheads of ſugar coſt* 320 l. 12 s. *what will* 5 *of theſe hogſheads be worth?*

Hhds. *l.* *s.* *Hhds*
17 320 12 5
20

6412 Shillings
5 Hhds } Multiply

17)32060 (1881 5 (94 5 10 2 6/17
....
150 8
146 0 Remains
100

15 Shillings remain
12 Pence in a ſhilling } Multiply

30
15

17)180(10 Pence
10 Pence remain
4 Farthings 1 Penny } Multiply

17)40(2 Farthings

6 Farth. remain to be divided by 17

Note, That when you have multiplied the ſecond and third numbers together, and divided the product by the firſt, the quotient is of the ſame denomination as the ſecond number is, after you have reduced it (as in the laſt example) into its loweſt denomination given.

Example. *If* 4 *C* 1 *qr* 24 *lb of ſugar coſt* 14 *l. what will* 18 *C coſt?*

C	qr	lb	l	C
4	1	24	14	18
4				18
42				18
45				18

500 *lb* of ſugar

2016 *lb* of ſugar
14 *l* ſterling } Multiply

8064
2016

5100)2°2124(56 8 11 2$\frac{40}{500}$ Anſwer *l s d q*
...

32

224 Pounds remain
20 Shillings in 1*l* } Multiply

5100)44810(8 Shillings
.

480 Shillings rem.
12 Pence in 1*s* } Multiply

960
480

5100)57160 (11 Pence
..

7

260 Pence remain
4 Farthings 1*d.* } Multiply

5100)10140(2 Qrs
...

40 Farthings remain to be divided by 500

Note farther, That what farthings remain, to be divided by the common diviſor, [as in the laſt example] becauſe you can reduce them into no lower denomination, you may place them over your diviſor, as fractions of a farthing, which ſhall be explained when we come to treat of vulgar fractions, *&c.*

Caſe] When the firſt number of the three given is but an unit, the operation is performed by multiplication only.

Example. *If I give* 15 s *for a pound of thread, what will* 250 lb *coſt at that rate?*

lb	s	lb
1	15	250

15

1250
250

3750*s* Anſwer, or 187*l* 10*s*

Example. *At* 14*l* 10s 6d *per bag of hops, what coſt* 55 *bags?*

Bag	*l*	*s*	*d*	Bags
1	14	10	6	55

20

290 Shillings
12

3486 Pence
55 the 3d number } Multiply

17430
17430

191730 Pence Anſ. or 798*l* 17*s* 6*d*

Caſe] When the third number of the three given [or that towards the right hand] is an unit; ſuch operation is performed by diviſion only; if the number need no reducing.

Example *If* 40 *pieces of broad cloth coſt* 590l *what will one piece coſt?*

Pieces l Piece
40 590 1

410)5910(14½l or 14l 15s Answer

19

30 Pounds remain

If one bushel of rye cost 3s 6d, *what will a last or* 10 *quarters cost after that rate?*

First reduce the 3s 6*d* into pence, that is 42*d*, and the 10 quarters into bushels, that is 80, and set the question thus:

If 1 *bushel cost* 42d, *what will* 80 *cost?*

80

3360

The first number, or place being 1, will neither multiply nor divide, then bring the 3360*d* into shillings by dividing by 12, as followeth.

12)3360(280 Shillings
24
96
96
0

20)280(14*l*
20
80
80
0

14*l*

For the proof of this, and the like questions, reduce the answer into pence, to know whether your work be right, as appears in the work.

280
12
3360

If I paid 432 l *for* 525 *quarters of malt, what is the price of* 1 *quarter after that rate?*

Which being ſtated ſtands thus,

If 525 *quarters coſt* 432l *what will* 1 *quarter coſt?*

In this queſtion you cannot multiply the ſecond number by the third, becauſe the third number [or place] is but one.

Therefore to perform this queſtion with eaſe, reduce 432*l* into farthings by reduction, which makes 414720 farthings to be divided, which divide by 525, the quarters of malt, and the quotient, the anſwer, is 789 farthings; the remainder after the diviſion is ended, are but the parts of a farthing.

Laſtly, The 789 farthings being reduced, are 16 *s.* $5\frac{1}{4}$*d.* Therefore, if 525 quarters of malt [or tods of wool or goods] be ſold for 432*l.* one quarter will coſt 16*s.* $5\frac{1}{4}$*d.* after that rate. Or, which is better, reduce the 432*l.* into ſhillings, and it gives 8640, which divide by 525, and the quotient is 16, and the remainder 240, which multiply by 12 the product is 2880, which divide by 525, the quotient is 5 pence, and the remainder 255; that multiplied by 4, and the product 1020 divided as before, gives 1 farthing, and $\frac{495}{525}$ parts of another farthing.

If a grocer bought $5\frac{3}{4}$ C. *weight of nutmegs, which coſt him* 163l. 13s 8d. *how may he ſell one pound weight without gain or loſs?*

Reduce the money into pence, it makes 39284*d.* for the dividend, and $5\frac{3}{4}$ C. weight into pound weights by reduction, makes 644 pound weight for the diviſor; then divide the 39284 by 644, and the quotient gives 61 pence, the price of one pound, *viz.* 5*s.* 1*d.*

Note, That what ſum of money you deſire to gain, add it to the price, and work as above, to know what you get by every ſingle pound.

Suppoſe the yearly rent of 20l. *belonging to* 7 *landlords*

Reduce the 20*l.* into farthings, and they are 19200, which divide by 7, the quotient gives $2742\frac{6}{7}$ farthings for each landlord, from which you may ſubtract the taxes.

By the ſame rule you may draw a compariſon of debts; for if a man owe to ſeveral creditors, as ſuppoſe it comes to in all 35*l.* 16*s.* reduce it into farthings, and divide it by the number of pounds owing, *&c.* As,

Suppoſe a man leaveth 13l *to pay his debts, and he owes one man* 5l *the ſecond* 6l *and the third* 7l *which makes* 18l *what is each man's ſhare?*

	l	*s*	*d*	*q*
To the firſt	3	12	2	2
—Second	4	06	8	0
—Third	5	01	1	2
	13	00	0	0

If 28 *quarters of barley coſt* 30l 10s 6d, *tell me what* 84 *quarters come to at that rate?*

28 qrs coſt 30l 10s 6d, what will 84 qrs coſt?

	20		12
		28) 615384	(21978 pence
Shillings	610	56	
	12		210 18311—6
		55	
	1226	28	£ 91—11—6
	610		
		273	
Pence	7326	252	
	84		
		218	
	29304	196	
	58608		
		224	
Sum	615384	224	
			(0)

84 qrs comes to 91l 11s 6d

For a proof I reduce the 91l 11s 6d into pence

	20
	1831
	12
	3668
	1831
	21978

How many yards of cloth ſhall I buy for 21l 10s 1½d. *when* 3¼ *are ſold for* 2l 14s 3d?

Firſt, reduce the 2l 14s 3d into farthings, which make 2604, for the firſt number; next, the 3 yards and

an half into quarters, which make 14 for the ſecond number, and the 21*l* 10*s* 1½*d*. and it makes 20646 farthings; then multiply that by 14, and the product is 289044, to be divided by 2604, and the quotient gives 111 quarters of yards, to divide by 4, (the quarters in a yard) and the quotient is 27 yards ¾, *viz.* 3 quarters, anſwer.

Thus ſtated being reduced.

Farthings	Quarters	Farthings
2604	14	20646
		14

If one pound of iron coſt 3½d, *what will* 7 C 3 qrs 17 lb *coſt?*

4

31 qrs of an hundred
28 lbs in ¼ of an C
—— take in 17 lb
255
63

Pounds 885 in 7 C 3 qrs 17 lb
14 farthings in 3½d

3540
885

4) 12390 farthings anſwer

12) 3097 ½

2lo) 2518 1

Anſwer £ 12 18 1½

Note, That this example may ſerve for a rule to reduce hundreds, quarters, and pounds into pounds; but moſt tradeſmen ſet the weights in ſhort, thus, 7—3—17 inſtead of ſetting them as above 7C 3qrs 17 lb

Beſides this way of proof, of reducing the total to farthings again, is moſt neceſſary for young learners, in moſt of the queſtions in the rule of three.

The Indirect Rule *of* Three.

IN the *indirect rule of three*, the numbers are in reciprocal proportion, that is, the fourth number to be found, is to bear the ſame ratio to the ſecond as the third does to the firſt, but in an inverted order; that is, the greater the third term is in reſpect to the firſt, the leſs muſt the fourth be in reſpect to the ſecond.

This rule differs in its operation, from the direct, in that, after the queſtion is ſtated. and the numbers of the ſtatings prepared (as in the direct rule) your firſt and ſecond muſt be multiplied together, and your third number be your diviſor. The quotient, as before, will be the anſwer.

EXAMPLES.

Ex. 1. *What number of men muſt be employed to finish in* 12 *days, what* 43 *men would be* 35 *days about?*

days	*men*	*days*
35	43	12

43

105
140

12)1505

Anſwer, 125 men

Ex 2. *How many yards of ſtuff* 3 *qrs wide, will hang a room which requires* 420 *yards of* 5 *qrs wide?*

qrs	*yds*	*qrs*
5	420	3

5

3)2100

Anſ. 700

The reaſon of this operation will appear plain (after what has been ſaid in the direct rule) by conſidering the laſt example. Now it is clear, that if of the ſtuff, being 5 quarters wide, there are 420 yards required, then were the ſtuff but 1 quarter wide, 5 times 420 yards, *viz.* 2100 yards muſt be allowed; conſequently, if the ſtuff be 3 quarters wide, one third part of thoſe yards will be ſufficient; therefore 2100 divided by 3, will give the true anſwer required, *viz.* 700 yards.

To know whether a queſtion belongs to the Direct or Indirect Rule *of* Three.

Obſerve, If the third number, being more than the firſt number requires more, or, being leſs, requires leſs, it is *Direct*; but if the third number, being more, requires leſs, or being leſs, requires more, it is *Indirect*.

Or, without any regard to the diſtinction of *Direct* and *Indirect*; if *more* is required, let the leſſer of the two extremes be the diviſor, if *leſs*, the greater.

More queſtions in the Indirect Rule *of* Three.

If I lend *A* 136*l* for 3 months, how long muſt I keep 42*l* of his, to requite myſelf?

Anſwer, 9 months, 2 weeks, 6 days.

If 46 clerks in 32 days finiſh a piece of writing, in what time would 55 clerks accompliſh the ſame?

Anſwer, 26 day, 9 hours, 9 minutes.

A garriſon, conſiſting of 1539 men, being beſieged, hath proviſion only for 12 days; but it being neceſſary they ſhould hold out three weeks, how many men muſt be ſent out?

Anſwer, 660 men.

The Double Rule *of* Three.

QUeſtions in this rule have five numbers propoſed and are frequently anſwered by two ſtatings, tho' they may be performed by one as ſhall be ſhewn hereafter.

EXAMPLES.

Ex. 1. *The carriage of* 32 *hundred weight* 56 *miles comes to* 12*s. After the ſame rate, what muſt I pay to have* 78 *hundred weight carried* 94 *miles?*

1ſt *If* 32 C —— 12 *s* —— 78 C

12

32)936(29 *s* — 3 *d* *facit*
64

296
288

8

12

32(96(3
96

0

Then, *If* 56 *Miles* — 29-3 *s d* — 94 *Miles*

12

351
4

1404
3159

56)32994(589
280

499
448

514
504

10

12)589(1

210)419

fac 2*l* 9*s* 1*d*

Note, The ſolution had been the ſame, if the miles had been made firſt and third numbers of the firſt ſtating; and the *C* weights the firſt and third numbers of the laſt.

Note alſo, this example may be done by one ſtating, thus:

C	*s*	*d*
If 32	—— 12	—— 78
56 *Miles*		94 *Miles*
192		312
160		702
1792		7332
		12
		1792)87684(49 1
		7168
		l *s* *d*
		16304 2 9 1
		16128
		176
		12
		1792(2112(1
		1792
		320

Ex. 2. *How many men muſt be employed to reap* 420 *acres in* 17 *days, if there were required* 37 *men to reap* 54 *acres in* 5 *days?*

	Acres	Men	Acres.
First, *If*	54	37	420
			37
			2940
			1260

	Days	Men	Days	
Then, *If*	5	287	17	54) 15540 (287
		5		108
				474
	17) 1435 (84			432
	136			
	75			420
	68			378
Anſ. 84 Men	7			42

Note, If you would work ſuch queſtions of the *double Rule of Three* as have one of their proportions indirect, by one ſtating; you muſt multiply the third number of your ſtating, by that number you would otherwiſe have placd under your firſt; and your firſt number by that you would have placed under the third; as in the following example.

EXAMPLE.

Acres	Men	Acres	
If 54	37	420	
*17		5	The number of days which have relation to the 54 acres
378		2100	
54		37	
918		14700	
		6300	

*The number of days which have relation to 420 acres.

——— Men

918) 77700 (84 anſwer as before

7344

4260

3672

588

Of EXCHANGE.

HAving explained the nature of the Rule of Three, and the manner of reſolving queſtions therein, I am naturally led to treat of its particular uſe in the exchange of coins.

In the exchange of coins, it is neceſſary that the par or value of the money in each place be exactly known: for the word *par* ſignifies to equalize the money of exchange from one place with that of another place. As when I take up ſo much money *per* exchange in one place, to pay the juſt value thereof in another kind of money in another place, without having reſpect to the price current of exchange for the ſame, but only to what the money does currently paſs for in each place. From whence may be eaſily found out the profit and loſs of all monies drawn or remitted by exchange. But this *par* being grounded principally upon the current value of coin, the plenty and ſcarcity thereof, the riſing and falling, inhancement and debaſing of the ſame, it muſt neceſſarily follow, that the value of coin is ſubject unto change. An example whereof you have in *France*, where their coin has been changed, inhanced, and lowered, ſeveral times in a few years: and in the year 1720, the *French* crown, which was ſixty ſous or three livres, is now raiſed to ſeventy five ſous, or three livres, fifteen ſous.

The denomination in which England, *and the following places exchange each with other are*, viz.

The exchange of monies from *London* to *Antwerp*, *Amſterdam*, *Hamburgh*, *Liſle*, *Middleburgh*, and other parts of *Flanders* and *Holland*, is valued on the pound ſterling of 20 ſhillings: that is, to pay after the rate of ſo many ſhillings and pence *Flemiſh*, for every pound ſterling.

The exchange from *London* to *Paris*, *Roan*, and moſt parts of *France*, is valued on the *French* crown at 54*d.* that is to pay ſo many pence, or ſo many ſhillings and pence ſterling, for the *French* crown.

The exchange from *London* to *Venice* is made on the ducat at 52*d.* ſterling, to pay ſo many pence and parts of a penny ſterling for every ducat.

The exchange from *London* to *Leghorn*, *Genoa*, *Calais*, *Madrid*, and other parts of *Spain*, is made on the dollar or piece of eight, at 54*d* ſterling, that is, to pay ſo many pence or parts of a penny ſterling for every dollar.

The par at *Antwerp*, *Amſterdam*, *Hamburgh*, *Liſle*, *Middleburgh*, and other parts of *Flanders*, with one pound ſterling, is thirty three ſhillings four pence *Flemiſh*, for a pound ſterling; which thirty three ſhillings four pence do make 10 guilders at two ſhillings ſterling the guilder, or 10 livres *Turnois*.

The par at *Paris*, *Roan*, and other ports of *France*, has been reckoned ſometimes at 71 ſous the crown of 3 livres, *Turnois*, generally at 60 ſous the crown of 3 livres, every livre valued at 1 ſhilling ſixpence ſterling, the crown valued at 4*s* 6*d* ſterling.

The par at *Leghorn*, *Madrid*, *Calais*, *Genoa*, is at 54 pence ſterling for the dollar or piece of eight.

The par at *Venice* with our ſterling money is at 6 livres, 4 ſous of *Venice per* ducat, or 51 pence ſterling, ſometimes 52 pence.

The *Hamburgh* par is ſometimes reckoned at 4 rix dollars and a half, which makes 32 ſhillings *Flemiſh* for 20 ſhillings ſterling.

The par at *Lisbon* is at 6*s* 8$\frac{1}{2}$*d* on the milrea or 1000 reas.

The par at *Oporto* is the ſame as that at *Lisbon*.

The value of the moſt uſual coins with which England *does chiefly exchange, are*, viz.

		Sterling money. s.	d.
Holland and *Flanders*	1 Stiver is — — — —	0 —	1$\frac{5}{7}$
	6 Stivers of 1 ſhilling *Flemiſh* is —	0 —	7$\frac{1}{7}$
	1 *Flemiſh* ſhilling — — —	0 —	8
	20 Stivers is 1 guilder, or —	2 —	0
	6 Guilders 1 pound *Flemiſh*, 20*s*. is	12 —	0
	33 Shillings 4*d* *Flemiſh* is —	20 —	0
	1 *Zealand* common dollar is —	3 —	0
	1 Duccatoon —— — —	5 —	6
	1 ſpecie dollar — — —	5 —	0

Sterling money.

		s.	d.
France	12 Deniers, or 1 ſoluz is	0	$3\frac{3}{5}$
	20 Soluz or livre is	1	6
	3 Livres, or a *French* crown	4	6

		s.	d.
Spaniſh money	$13\frac{77}{100}$ Malvadees	0	$0\frac{1}{4}$
	372 Malvadees, or 1 Royal	0	$6\frac{3}{4}$
	$7\frac{10}{17}$ Royals is 1 ducat	4	4
	8 Royal or piece of copper	4	6
	1 Royal copper	3	0
	$17\frac{1}{2}$ *ditto* copper is 1 piece of eight, or	4	6

		s.	d.
Portug.	$12\frac{1}{2}$ Reas of *Portugal*	0	1
	1 Milrea, or 1000 reas	6	$8\frac{1}{2}$
	1 Teſtoon is	1	3

		s.	d.
Italy	1 Livre at *Leghorn* is	0	9
	1 Crown current at *Florence* is	5	3
	1 Ducat du banco at *Venice*	4	4
	1 St Mark	2	10
	1 *Palermo* florin is	2	6

		s.	d.
Germany	1 Rix-dollar of the empire	4	$5\frac{3}{4}$
	$4\frac{1}{2}$ Rix-dollars makes 32 *Flem.* at *Hamburgh*, &c.	20	0
	1 Guilder of *Noremburg*	7	1

A merchant in London *remits to* Rotterdam 375l 10s *ſterling at* 34s 8d *for* 20s *ſterling, How many Guilders* Flemiſh *muſt be paid at* Rotterdam, *and what is gained* per *exchange?*

s.	s.	d.		l.	s.	d.
20	35	8	*Flem.*	what 375	10	0
	12			20		
	416			7510		
				416		
				45060		
				7510		
				30040		
			Guilders, ſtivers.	210)3124	6	10
			Anſw. 3905—4	2)156208		
				210)78104		
				3905		

To find the gain or loſs in one pound, ſubtract 33*s.* 4 *d.* out of 34 *s.* 8 *d.* the courſe of exchange, the difference is 1 *s.* 4 *d. Flemiſh per* pound, and ſo much gain is the courſe of exchange in our favour.

If the courſe of exchange be under par, it muſt by parity of reaſon become a loſs to us, and then the courſe of exchange is to our prejudice.

The like to be obſerved for the coins exchanged in all other countries.

I will give but one example of loſs by exchange, by which, with the foregoing example of gain, the ingenious may with eaſe, travel through the general courſe of exchange with all countries.

A merchant in *London* remits a bill of exchange to *Amſterdam* for 297 *l.* 15 *s.* ſterling, at 31 *s.* 3 *d. Flemiſh* for 20 *s.* ſterling I demand how much *Flemiſh* money was paid for the ſaid bill at *Amſterdam*, and what is loſt *per* pound by exchange?

s	s	d		l	s	
20	31	3	*Flem.*	297	15	ſterling
			Guild.	*Shill.*		

Anſwer, 279 ——— 8 paid, and 2 *s* 1 *d Flemiſh per* pound loſt by the exchange.

Arithmetical Progreſſion.

IS when a rank or ſeries of numbers differ orderly from one another, by ſome common number.

To find the ſum of any arithmetical progreſſion, add the firſt and laſt numbers together, and multiply that ſum by half the number of places, and that prod ct is the ſum. But if the number of places be odd, multiply the ſaid number of places by half of the firſt and laſt added, and that product is the ſum.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.

What the ſum?

16 Laſt
1 Firſt

17 Sum
8 Half of the number of places

136 Sum of the whole

Suppoſe a man hireth a room for a year, and agreeth to pay the firſt week 5d. *the ſecond week* 9d, *and for the third week* 13d. *ſo paying every week* 4d. *more until* 52 *weeks or a year is finiſhed, I demand what the rent will come to?*

Anſwer 23*l.* 3*s.* 8*d.*

Here you are to conſider that the common increaſing number is 4*d.* ſo that the laſt week muſt amount to 51 times 4, added to the pay of the firſt week, which is 5*d.* then will the laſt week come to 209 pence, then work as in the example.

	51	12(5564)463s
	4	48
Product	204	76
	5	72
Added	209 the laſt week	44
	5 the firſt week	36
Added	214	8d.
	26 half weeks in the year	
	1284	210)4613(23l. 3s. 8d.
	428	
Pence	5564	

Geometrical Progreſſion.

Suppoſe one ſold 12 *ells of cloth, to receive for the firſt ell* 1d. *the ſecond* 2d *the third* 4d. *and ſo doubling, what is paid for the* 12 *ells?*

0, 1, 2, 4, 3, 5, 6.
1, 2, 4, 8, 16, 32, 64.
32
128
192
2084
2
Anſwer 4096 Pence

Note, That if this queſtion had been for a farthing a button, or the like, the anſwer would have been farthings.

Suppoſe one ſold a horſe having 4 ſhoes, and every ſhoe 6 nails, to receive for the firſt nail 1 farthing, the ſecond nail 2 farthings, the third nail a penny, and ſo

doubling, how much is paid for the laſt nail, and the price of the horſe? *Anſwer* 17476l. 5s.

0, 1, 2, 3' 4, 5, 6, 7, 8, 9, 10, 11, 12.
1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096

4096

12288
18432
81920

8388608
2

Farthings 16777216

Or if this queſtion had been of a coat ſold at a barley-corn a button, and ſo doubling to 24 buttons (accounting 900 corns to a pint) I divide the 16777216 by the 900 corns, the quotient gives about 11641 pints, which divide by 64 (the pints in a buſhel) the quotient gives about 262 buſhels, or about 36 quarters of barley for the coat.

The Rule of Fellowſhip *or* Company.

MAY fitly be divided into gain, loſs, and time.

A general Rule.

As general ſtock to general profit bears.
So each man's ſtock in general profit ſhares.

That is to ſay,

Every man's particular ſtock being added together, the total muſt be the firſt number in the rule of three, the gains the ſecond, and every man's particular ſtock the third; as,

Suppoſe two bookſellers in company, *Y* laid in 20*l.* *Z* laid in 40*l.* whereby was gained 50*l.* what is each man's part of the gain?

Y	20
Z	40
	60

If 60*l*. gain 50*l*. what will 20*l*. gain?

20

60)1000(16*l* 13*s* 4*d*
6

40
36

4

If 60*l* gain 50*l* what will 40*l* gain?

40

60)2000(33*l* 6*s* 8*d*
18

20
18

2

l	*s*	*d*
33	06	8
16	13	4
Proof 50	—	—

Suppoſe two merchants make a ſtock, *B* laid in 45*l*. and *C* laid in 68*l*. whereby was gained 32*l*. how muſt the gain be divided?

If 113*l* gain 32*l* what will 45*l* gain?

B	45
C	68
	113

45

160
128

113)1440(12*l* $\frac{84}{113}$ *B*'s part
113

310
226

84

If 143*l* gain 32*l*. what will 68 gain?

68

256
192

113)2176(19*l* $\frac{29}{113}$ *C*'s part
113

1046
1017

29

The 29 of the fraction multiplied by 240, [the pence in 20*s*] and the product divided 113, the quotient tells the pence.

Suppoſe three merchants, *F*, *G*, and *C*, join their monies to make a ſtock of 25000*l*. of which *F* laid in 10000*l* *G* 8000*l*. and *C* 7000*l*. with this [after a certain time of trading] they gained 7500*l*. how muſt this be parted?

If 25000*l* gain 7500*l*, what will 10000*l* gain?

10000

25000)75000000(3000*l* *F*'s part
75

00000

If 25000*l* gain 7500*l*, what will 8000*l* gain?

8000

25000)60000000(2400l *G*'s part
50

100
100

0

If 25000l gain 7500, what will 7000l gain?

7000

25000)52500000(2100l *C*'s part

50	*F* 30000l	} Stocks added
25	*G* 24000l	
25	*C* 21000l	
0	75000	

The Rule of Fellowſhip *with* Time.

The Rule.

EVERY man's ſtock muſt be multiplied by his time, and the total of thoſe products added together is the firſt number, the gain or loſs the ſecond number, and the product of every man's particular ſtock and time the third number.

Suppoſe two merchants in company, *A* laid 100l for 4 months; *B* put in 136l for 3 months, and they gained 50l, what is each man's part?

A put in 100l
B put in 136l } Multiplied by { 4 / 3 } give { 400 / 408 }

808

If 808l gain 50l, what will 400l gain?

400

808)20000(24l $\frac{608}{808}$ *A*'s part

1616

3840

3232

608

If 808 gain 50l what will 4081 gain?

408

400
2000

808)20400(25l $\frac{200}{808}$ *B*'s part
1616

4240
4040

200

Suppoſe three farmers, as *A*, *B* and *C* hold a paſture, for which they pay 45l *per annum*, *A* hath 24 oxen 32 days, *B* hath 12 there 48 days, and *C* fed 16 oxen there 49 days, what muſt every man pay of the rent?

Oxen		Days		
A 24	Multiplied by	32	give	768
B 12		48		576
C 16		49		384
				1728

RULES *of* PRACTICE.

The even parts

Of a pound			*Of a ſhill.*		*Of a hund.*	
s	d	l	d	s	lb	C
10	0	is $\frac{1}{2}$	6	$\frac{1}{2}$	56	$\frac{1}{2}$
6	8	$\frac{1}{3}$	4	$\frac{1}{3}$	84	$\frac{3}{4}$
5	0	$\frac{1}{4}$	3	$\frac{1}{4}$	28	$\frac{1}{4}$
4	0	$\frac{1}{5}$	2	$\frac{1}{6}$	14	$\frac{1}{8}$
3	4	$\frac{1}{6}$	1 $\frac{1}{2}$	$\frac{1}{8}$	16	$\frac{1}{10}$
2	6	$\frac{1}{8}$	1	$\frac{1}{12}$	8	$\frac{1}{14}$
2	0	$\frac{1}{10}$			7	$\frac{1}{16}$
1	8	$\frac{1}{12}$				

1. When the given price is pence, take your parts in ſhillings, the product divided by 20 gives the anſwer in pounds.

Or, You may bring it into pounds, at once, by cuting off the laſt figure, and by conſidering that 240 pence is 1 pound, whereof 8*d* is $\frac{1}{30}$, 6*d* is $\frac{1}{40}$, 4*d* is $\frac{1}{60}$, 3*d* is $\frac{1}{80}$, 2*d* is $\frac{1}{120}$.

EXAMPLES.

	254 lb. of tobacco at 1*d*			716 ells at 3*d*	
			d.		*s* *d*
$\frac{1}{12}$	21 1 2*d*		$3\frac{1}{80}$	*l* 8—19—0	*Facit*
l.	1—1—2	*Facit*		215 lb. at 4*d*	
	254 lb. at 2*d*		*d.*		*s* *d*
$\frac{1}{10}$	42—4		$4\frac{1}{80}$	*l* 3—11—8	*Facit*
l.	2—2—4	*Facit*	*d.* $6\frac{1}{120}$	643 gall. at 6*d*	
				s *d*	
				l 16—1—6	*Facit*

The three laſt examples are brought into pounds at one operation, after which manner any ſum in practice may be readily caſt up.

Here you may ſee that 254 pounds of tobacco, at 1*d* a pound, divided by the $\frac{1}{12}$, gives 21 *s* 2*d*, and that divided by 20 (by cutting of the laſt figure, and taking $\frac{1}{2}$ of it) gives 1*l* 1 *s* 2*d*, the price of 254 pounds of tobacco: and for 2*d* the pound take the $\frac{1}{10}$, becauſe 2*d* is the $\frac{1}{10}$ part of a ſhilling, and for 3*d* a pound take $\frac{1}{4}$, and ſo for the others at 4*d* and 6*d*.

2. When the given price is ſuch pence as are no even part of a ſhilling, take firſt the greateſt even parts of a ſhilling, and then part of that part: add them together, and divide the product by 20, or cut off the laſt figure, and take $\frac{1}{2}$.

d	2121 ells at 5 d	748 lb. at 7 d
4 1/2	707 s	6d is 1/2 or 374
1 1/4	176—9	of which 1d, or 1/6 is 62—4
5	882—9	436
	44—3—9 *Facit*	121—16—4

254 lb of tobacco at 9d and 10 1/4 a lb

d		d	254 at 10 1/4 d
6 1/2	127	6 1/2	127 ſhillings in 2546 d
3 1/2	63—6	4 1/2	84—8 in 254 groats
9 1/2	190—6	1 1/2	10—7 in 254 halfpence
	9—10—6 *Facit*	1 1/2	5—3 1/2 in 254 farthings
			2217—6 1/2
			11—7—6 1/2 *Facit*

Demonſtration. In 254 pounds of tobacco at 10 1/4 d a pound, there muſt be 254 ſixpences, which is 127 ſhillings, and 254 groat, which is 84s 8d. and 254 halfpence, which is 10s 7d and 254 farthings, which is 5s 3 1/2 d, all theſe added together, make 227s 6 1/2 d, which divided by 20, gives the anſwer 11l 7s 6 1/2 d.

d	614 lb at 11d	563 lb at 11 1/4 d
6 1/2	307	6 1/2 281—6d
4 1/2	204—8d	4 1/2 187—8
1 1/4	51—2	1 1/2 1/4 70—4 1/2
11	5612—10	5319—6 1/2
	28—2—10 *fa*	26—19—6 1/2 *facit*

3. If the given price be any number of pence above 1s and leſs than 2s, take the aliquot parts in pence, (as in the laſt precedent) to which add the given quantity for the 1s, and proceed as before.

EXAMPLES.

1/4	254 lb at 15 d	254 lb at 17 d	
d	63—6	1/2 84—8	
	3 17—6	1/2 21—2	
	15—17—6 *facit*	3 19—10	
		17—19—0 *facit*	
1/2	264 yds at 18 d	295 gall. at 19 d	
	132	1/2 147—6	
	3916	1/20 24—7	
	19—16—0 *facit*	4617—1	
		23—7—1 *facit*	
1/2	672 lb at 22 3/4 d	456 ells at 25 1/4 d	
	336	1/2 228	
1/3	224	1/3 152	
1/8	42	1/4 38	
	12714	1/5 9—6	
	63—14—0 *facit*	8813—6	
		44—3—6 *facit*	

In 672 lb at 22¾ d a lb I take ½ for 6 d, the ⅓ for 1 d, and the ⅛ for the ¾, becauſe ¾ is the ⅛ of 6d, by which you will find that in 672 ſixpences there is 336 ſhillings, and in 672 groats there is 224 ſhillings, and in 672 three farthings there is 42 ſhillings.

4. If the given price be ſuch ſhillings as are an even part of a pound ſterling, take ſuch a part of the given quantity, and the quotient is pounds.

	Ells s d	Yards
	433 at 1—8	271 at 2s
1/11	36—1—8 *facit*	1/10 27—2—0 *facit*
	674 at 2 6d	495 at 3s 6d
1/5	84—5—0 *facit*	1/6 82—10—0 *facit*

	Crowns		Dollars
	457 at 5s		612 at 4s
½	114 5-0 *facit*	⅓	122 8-0 *facit*
	295 at 6s 8d		372 at 10s
⅓	98-6-8 *facit*	½	186 0-0 *facit*

In this first example of 433 ells, at 1s 8d I take the $\frac{1}{12}$ because 1s 8d is the $\frac{1}{12}$ of 1l, and say, 12 in 43 is 3 times, rest 7, which makes the 3 to be 73, then 12 in 73 is 6 times, rest 1, which is 1s 8d, which I put down as above

5. If the given price be such shillings and pence as are no even parts of a pound, multiply the given quantity by the number of shillings, and take the aliquot parts of pence, and proceed according to the second rule.

	Ells		Ells
	375 at 8s 6d		493 at 15s 10d
	8		15
	3000		2465
½	187-6		493
		½	246-6d
		⅓	164-4d
	31018-6		78015-10
	159-7-6 *facit*		390-5 10 *facit*

	C s d		C s d
	295 at 12-9		214 at 7-11
	12		7
	3540		1498
½	147-6	½	107
½	73-9	½	53-6
		⅓	35-8
	37611-3		16914-2
	188-1-3 *facit*		84-14-2 *facit*

6 If your given price be any number of pounds, ſhillings and pence; reduce firſt your pounds and ſhillings into ſhillings, and proceed according to the laſt rule.

Pieces	l	s	d	Tuns	l	s	d
754 at	4	3	7	176 at	3	7	10
83	20			67	20		
2262	83			1232	67		
6032				1056			
377				11792			
62	10			88			
630211	10			58	8		
3151	1	10	*facit*	1193	8	8	
				596	18	8	*facit*

7 If your given price be any number of pounds, and exceeding five pounds, then multiply your given quantity by the number of the pounds, and take your aliquot parts in ſhillings and pence, *viz.*

C	l	s	d	Hhds	l	s	d
74 at	11	12	6	394 at	16	16	3
11				16			
814				2364 }			
37		d		394 }	at 16l		
s. 9	5	0		197 at	10s		
10 ½				98	10 at	5	
2½ ¼				19	14 at	1	
860	5	0	*facit*	4	18	6 at	3d
1				1 6624	2	6	*facit*

8 If the given quantity be any number of C. qrs. or pounds; or tuns, C qrs and pounds, *&c.* work as before where no part is, and take your aliquot parts in quarters and pounds, or in C qrs and pounds and add them to your firſt work. An example or two will make this plain

C		s	d	C		s	d
75	½ at	22	6	63	¾ at	12	10
22				12 mult.			
		11	3				
150				756s			
150				31	6d		
½ 37		6		¼ ½ 21			
11		3		9	7½C		
16918		9		8118	1 Sum.		
84	18	9	*facit*	40	18	1½	

In the example of 63 C ¾ at 12s 10d the C weight, I multiply the C by 12 s, and take the parts in pence for the odd pence; then for the ¾ of C I first take the ½ of the price of a C, and that makes 6s 5d, the price of ½ a C, and then I take the half of that, which gives 3s 2½d the prime of a qr of a C. Add them together, it gives the price of ¼ of a C which is 9s 7½d, and must be added to your first work. Two or three examples more will make it familiar and easy to any capacity.

84 C 3 qrs 11 lb at ——— ——— 21s 10d

21

84

168

½ 42

½ 28

18 6

18512 6

92 12 6

½	10	11	
lb ¼	5	5	½
7 ¼	1	4	¼
4 ½	0	9	½
	18	6	

The price of 3 qrs 11 lb.

Tun	C	qr	lb		l	s	d	
12	14	3	14	at	15	17	06	a tun
							12	
					190	10	00	
					7	18	9	
					3	3	6	
					0	7	11¼	
					0	3	11½	
					0	1	11¼	
					202	06	01½	

The Order *of Deducting* Tare *and* Tret.

GRoſs is the weight of a commodity, with the hogſhead, cheſt, box, or whatever elſe contains it.

Tare is the allowance given for the weight of the cask, hogſhead, *&c.*

Tret is an allowance of 4 pounds, in 104 pounds, for waſte and duſt on ſome ſort of goods.

	C	qr	lb		lb	lb
Exam. 11 hhs qt. 14 ⅛	45	3	15	groſs, tare 14 per 112 how many lb neat?		
	5	2	26	tare.		
Anſwer	40	0	17			

1. Here 14 pounds tare being ⅛ of 112 pounds, take ⅛ of the groſs, the quotient gives the whole tare, which ſubtract from the groſs, gives the neat weight.

The operation is performed thus: divide the groſs by 8, ſay 8 in 45, 5 times, and 5C remains, which is 20qrs, and 3 is 23; then 8 in 23, 2 times, 7 qrs remain, which turned into pounds by 28, and added to the 15 pounds, make 211 pounds, then 8 in 211 is 26 times. So the tare is 5 C 2 qrs 26 pounds.

	C	qr	lb.
Example.	40	0	17
	22		
	80		
	80		
	20		
	0	3	$4\frac{3}{4}$
	9010	3	$4\frac{3}{4}$
l.	45	3	$4\frac{3}{4}$

	s	d
Neat at	22	6
lb		
$14\frac{1}{8}$	2	$9\frac{1}{4}$
$2\frac{1}{7}$	0	$4\frac{3}{4}$
$1\frac{1}{2}$	0	$2\frac{1}{4}$
facit	3	$4\frac{3}{4}$

price of 17lb.

If the tare be $16\frac{1}{2}$ pounds in 112 pounds, take $\frac{1}{7}$ of the groſs, and work as before.

If 18 pounds *per* 112 pounds, for tare, take the aliquot parts, *viz.*

For 16 lb. take the $\frac{1}{7}$ } Add the tare of 16, and the
For 2 take the $\frac{1}{8}$ } tare of 2 together, the total ſubtract from the groſs, and work as before.

lb lb
If 20 in 112 for tare { for 16 take $\frac{1}{7}$ lb
for 4 take $\frac{1}{4}$ of 16

2. When an allowance is made for tret, then (after the tare is ſubtracted from the groſs) the remainder is called ſuttle, which divide by 26, (becauſe 4 pounds is the 26th part of 104, the allowance always given for tret) the quotient gives the tret, which ſubtracted from the ſuttle, gives the neat weight.

	C	qr	lb		lb		lb	lb
Ex.	45	- 3	- 15 gr. tare	16 in	112	tret 4 in	104	
16½	6	- 2	- 06 tare					
	39	- 1	- 09 ſuttle			4)	104	
	4						26	
	157							
	28							
	1265							
	314							
	4405	pounds ſuttle				26)	4405	
	169	tret					180	
						169	245	
	4236	neat pounds at 6*d*						11
6½	2	118*s*						

l. 105 - 18 - 0 *facit*

3. If the allowance for tare be 8 pounds, 10 pounds, 12 pounds, in 112, or any other leſſer number, whether an aliquot part of 112 nor not, in ſuch caſes, divide the groſs into two parts by 2, which will make it half hundreds, then ſay, 8 is $\frac{1}{7}$ of $\frac{1}{2}$ C. or of 12 pounds in 112 pounds.

Rule. From $\frac{1}{8}$ of the groſs, take $\frac{1}{7}$ of that 8th for tare at 12 *per cent.* When you have found tare ſubtract it always out of the whole groſs.

I might enumerate examples, but theſe being ſufficient to inſtruct any ordinary capacity in tare and tret,

I ſhall proceed to ſhew ſome other abbreviated ways of caſting up goods and merchandize.

For retailers of ſmall parcels, as mercers, linnen *and* woolen drapers, haberdaſhers of hats, *&c.*

THE moſt abbreviate and ready way is, to multiply the price by the quantity.

Example. Sold 7 yards of cloth, at 14s 6d. a yard.

7

Anſwer L. 5 - 1 - 6

Say 7 times 6 is 42, which is 3s 6d, ſet down 6 pence and carry 3 ſhillings to the place of ſhillings, and ſay, 7 times 4 is 28, and 3 I carry is 31, ſet down 1s, and carry 3 angels to the place of tens of ſhillings, and ſay, 7 times 1 is 7, and 3 I carry is 10 angels, which is 5l. fix the 5l in the place of pounds: ſo the price of 7 yards is 5l 1s 6d.

Example. Sold 11 yards and $\frac{1}{2}$ at 13s 3d.

11

L. 7 - 5 - 9
the $\frac{1}{2}$ yard 6 - $7\frac{1}{2}$

Anſ. L. 7 - 12 - $4\frac{1}{2}$

For half a yard, take half of 13s 3d and add to the product of 11 yards.

Object. There are many numbers under a 100 that are not included in the multiplication table, or being multiplied together, will not produce the given quantity; and ſo conſequently cannot be done by this new way of practice.

Anſ. It is very true, there are ſeveral numbers under 100, that no two numbers multiplied together can produce them, ſuch as 13, 17, 19, 25, 29, 31, 33, 37, and many more.

Rule. In ſuch caſes multiply by two ſuch numbers, as being multiplied together will come neareſt to ſuch odd numbers; then multiply the price by that part which wants to make up the given quantity. An example of which follows.

	s	d
Example. 29 ells at	7	- 9
	7	
	2 - 14	- 3
	4	
	10 - 17	- 0
	7	- 9
Anſ.	11 - 04	- 9

Here I multiply by 7 and 4, becauſe 7 times 4 is 28, and for the odd ell to make it 29, I add the price of the ell to the product.

Anſ. 11l 4s 9d

FRACTIONS

Are of two kinds { VULGAR, *and* DECIMAL.

A Vulgar fraction is cauſed by diviſion of whole numbers the remainder of which being leſs than the diviſor, called the numerator, is always the dividend, and the denominator is the diviſor.

3 Numerator.
4 Denominator.

A decimal fraction is ſuch a one, whoſe denominator is underſtood, and therefore need not be expreſſed: and is an unit with as many cyphers following it, as there be figures and cyphers in the numerator.

Decimal fractions, whether they ſtand alone, or be joined with integers, have always a comma or point before them to diſtinguiſh them from integers, as 5,560042

In decimals the value of every figure or cypher decreaſes by a tenfold proportion from the units place towards the right hand, as the whole numbers do increaſe the value towards the left hand, by the like proportion, as you may ſee in the following table.

6	5	4	3	2	1		1	2	3	4	5	6
C Thouſ.	X Thouſ.	Thouſ.	C.	X.	Units.		Tens.	Hund.	Thouſ.	X. Thouſ.	C. Thouſ.	
Whole numbers							Decimals					

Cyphers before integers, and at the end, or right hand of decimals are of no value; but after integers, and before decimals they have their value; for in integers they increaſe, and in decimals they diminiſh the value of the other figures joined with them.

The integers 005 is but 5, and 004 is but 4, and 06 is but 6.

But in decimals, ,005 is $\frac{5}{1000}$, and ,004 is $\frac{4}{1000}$, and ,06 is $\frac{6}{100}$.

And again, in integers 500 is five hundred, and 400 is four hundred.

In decimals 500 is but 5, and 400 is but 4, *&c.*

Next to abbreviation and valuation of vulgar fractions, there is little required, but to know how to bring a fraction of a leſſer name into a fraction of a greater name and to reduce fractions of diverſe unequal denominators to one common denominator, which being well underſtood, you may with as much eaſe add, ſubtract, multiply and divide a fraction as you can a whole number.

In decimals a fraction is ſeldom abbreviated; therefore,

1 *To abbreviate any vulgar fractions,* find ſuch a number for dividing both the numerator and denominator thereof ſo, that no remainder be on either of the diviſions

Example. Abbreviate $\frac{96}{120}$ into $\frac{4}{5}$ its loweſt term.

Say, 12 in 96, 8 times, and 12 is 120, 10, then the fractions is $\frac{8}{10}$; then ſay, 2 in 8, 4 times, and 2 in 10, 5 times, then the fraction is $\frac{4}{5}$, ſo that 4 is to 5, as 96 to 120.

2. *To know what part of a pound ſterling any number of ſhillings and pence is,* bring the ſhillings and pence

into pence for a numerator, and place 240 under it (the pence of one pound) for denominator.

Example. What part of a pound is 11*s* 3d?
Facit $\frac{135}{240}$.

3. To reduce vulgar fractions into decimals, Add cyphers at pleasure to the numerator, and divide by the denominator. Example, *viz.*

Reduce 11s 3d into a decimal fraction.

```
 12                2410) 1350000
---                ----   150
 135                        60
---- Numer. facit 5625     120
 240                       ----
                             0
```

Or, $\frac{5625}{10000}$, or .5625.

Example. Reduce $\frac{4}{5}$ into a decimal fraction.

```
5) 4000
-------
 ,800
```

Or rather .8 *facit* ,800

4. To value a vulgar fraction, Multiply the integer into the numerator, and divide by the numerator.

What is the $\frac{5}{8}$ of a pound sterling?

```
  20
   5
 ----        s   d
8) 100      (12--6
   4         facit
  84 d
```

```
          s    d
An ell worth 7---9 what is 2/5 worth?
                2
                ---
5) 15---6
facit 3---1 1/5
```

5. To value a mixt number, Multiply the mixt number by the numerator, and divide by the denominator. Example.

l *s* *d*

A ſhip worth 794—11—9 what is $\frac{4}{8}$ worth?

5

8)3972—18—9

facit 496—12—$4\frac{1}{8}$

6. To value a decimal fraction, expreſſing coin; every prime or unit in the firſt place is 2*s* value; every 5 in the ſecond place 1*s*, and the reſt farthings; but if they exceed $\frac{25}{1000}$, there muſt be one farthing abated.

Reduce $\frac{7}{9}$ of a pound into a decimal fraction.

9) ,700000

,77777

Here 7 primes is 14*s*, and 5 taken out of the ſecond place is 1*s*, which makes 15*s*, then 2 remains, which is 27 to the thirds, or place of farthings, out of which abate 1 for $\frac{25}{1000}$, it makes 15*s* $6\frac{1}{4}$*d*, which is the $\frac{7}{9}$ of a pound ſterling.

7. To reduce vulgar fractions to a common denominator, Multiply the numerator of each fraction into every denominator, except its own, which makes the product of a new numerator; then multiply all the denominators together, and that product is one common denominator to all the new numerators. Example.

l. *l.*

Reduce $\frac{2}{3}$ and $\frac{3}{4}$ to a common denominator.

Facit $\frac{8}{12}$ and $\frac{9}{12}$.

Here 12 the common denominator to both the new numerators, *viz* 8 and 9, and you find that 8 is to 12 as 2 to 3, and 9 is to 12, as 3 to 4.

So that $\frac{8}{12}$ is to $\frac{2}{3}$, and $\frac{9}{12}$ to $\frac{3}{4}$.

Reduce $\frac{3}{4}$, and $\frac{5}{6}$, and $\frac{7}{8}$ of a pound to a common denominator.

To prove your work, Divide your new numerator by the numerator of that fraction, and divide the common denominator of the fraction by the denominator, if both quotients are equal, your work is true

4			
6	18	40	42
—	8	4	4
24			
8	144	160	168
192	192	192	192

Exam $\frac{144}{192}$, is $\frac{48}{48}$ here divided by 3, make 48, and 192 divided by 4, gives 48, which was to be proved. Or, you may prove your work by abbreviation of fractions; but it is attended with much difficulty, where 4 or more fractions are reduced to a common denominator.

Now this reduction of fractions is of little use otherwise than to prepare a fraction to be either added, subtracted, multiplied, or divided.

As if the $\frac{3}{4}$ and $\frac{5}{6}$ and $\frac{7}{8}$ *l* were to be added together, reduce them first into a common denominator, as in the last rule, it makes $\frac{144}{192}$ and $\frac{160}{192}$ and $\frac{168}{192}$. Add all the new numerators together, make 472, which divided by 192, the common denominator, makes 2*l* $\frac{88}{192}$ as in the following example.

Addition of Vulgar Fractions.

144
160
168

192) 472
2) 88

l *s* *d*
Facit 2 $\frac{88}{192}$, or 9—2

And if the $\frac{3}{4}$ and $\frac{5}{6}$ and $\frac{7}{8}$ *l* were to be added together in decimals, reduce them first into decimal fractions, according to the third rule, and the operation stands, *viz.*

0000

Addition of Decimals.

$\frac{3}{4}$,75
$\frac{5}{6}$,8333
$\frac{7}{8}$,875

Say, 4 in 30 is 7 times, and 4 in 20 is 5 times; and so for the rest.

l *s* *d*
Facit 2 ,4583, or 2 9 2

By this addition you ſee how much leſs work is made by decimals than is in vulgar fractions, and how eaſy their value is found out according to the ſixth rule.

8. To reduce the compound fractions, or fractions of a leſſer name into the fractions of a greater, Multiply the numerators together for a new numerator, and the denominators multiply together for a new denominator.

Reduce $\frac{3}{4}$ of a penny into the proper fraction of a pound ſterling.

Say, $\frac{3}{4}$ of $\frac{1}{12}$ of $\frac{1}{240}$, or $\frac{3}{4}$ of $\frac{1}{2880}$, *facit* $\frac{3}{960}$.

9. To reduce a mixt number of a leſſer name into the fractions of a greater, Reduce the mixt number into an improper fraction, and work as before.

Reduce $3\frac{1}{2}d$ into the proper fraction of a pound ſterling.

$\frac{7}{2}$ of $\frac{1}{12}$ of $\frac{1}{240}$, or $\frac{7}{2}$ of $\frac{1}{2880}$, *facit* $\frac{7}{5760}$.

By the ſame rule you may reduce any ſort of weight or meaſure.

For compound fractions, their uſe is chiefly to bring fractions of divers denominations to one and the ſame denomination.

As if the $\frac{3}{4}$ of a penny, $\frac{2}{3}$ of a ſhilling, and $\frac{7}{8}$ of a pound were added together.

The $\frac{3}{4}$ of a penny muſt be reduced into the fraction of a pound, and the $\frac{2}{3}$ of a ſhilling, muſt be reduced into the fraction of a pound thus:

$\frac{3}{4}$ of $\frac{1}{2880}$ *fac.* $\frac{3}{960}$
$\frac{2}{3}$ of $\frac{1}{240}$ *fac.* $\frac{2}{80}$

Then the fractions to be added, are $\frac{3}{960}$, and $\frac{2}{80}$ and $\frac{7}{8}$, which reduce to a common denominator, and add them together, either by decimals or vulgar fractions.

Addition *of* Fractions.

1. IF the fractions to be added have one common denominator, add all the numerators together, and divide the product by the common denominator.

Example. Add $\left\{\begin{matrix}\frac{9}{12}\\ \frac{5}{12}\\ \frac{7}{12}\end{matrix}\right\}$ of a pound together.

12) 20

Facit $1\frac{8}{12}$

2. If the fractions to be added be of different denominators, reduce them to a common denominator, and proceed as before.

Example. Add $\frac{7}{8}$ and $\frac{3}{4}$ and $\frac{2}{3}$ together.

8	—	—	8	84
4	28	24	8	72
—	3	3	—	64
32	—	—	$\frac{64}{96}$	—
3	84	72		96) 220
—	—	—		—
96	96	96		*Facit* $2\frac{28}{96}$

To add $\frac{7}{8}$ and $\frac{3}{4}$ and $\frac{2}{3}$ of a pound in decimals, reduce them into decimal fractions, and add them up as in whole numbers, keeping the place of units just under each other.

Add $\left\{\begin{matrix}\frac{7}{8},875\\ \frac{3}{4},75\\ \frac{2}{3},6666\end{matrix}\right.$

2,2916

l s d

Facit 2—5—10

8) 71000

,875

4) 3000

75

3) 20000

6666

Subtraction *of* Fractions.

1. TO subtract fractions of different denominators, reduce them to a common denominator, and subtract the leſſer fraction from the greater.

Example. From $\frac{3}{4}$*l.* take $\frac{3}{4}$*l.* from $\frac{8}{12}$
— — take $\frac{9}{12}$
9 8 —
Facit $\frac{5}{12}$

2. If you have a mixt number (or integer and fraction) and the fraction to be ſubtracted be greater than the fraction from which you are to ſubtract,

Borrow an integer from the mixt number, and work as in the ſubtraction of whole numbers.

Example. From $11\frac{2}{3}$ — $\frac{8}{12}$
$2\frac{1}{4}$ — $\frac{9}{12}$
$8\frac{11}{12}$

Here I cannot take $\frac{9}{12}$ out of $\frac{8}{12}$, therefore, I borrow an integer, *viz.* 12, and ſay, 9 out of 12, reſts 3, to which add $\frac{8}{12}$, reſt $\frac{11}{12}$, and carry 1 to 2, is 3*l.* out of 11*l.* reſt 8; and *facit* $8\frac{11}{12}$.

From $25\frac{1}{12}$ from 42
Take $19\frac{7}{12}$ take $16\frac{15}{24}$
Facit $15\frac{8}{12}$ *facit* $25\frac{9}{24}$

Subtraction of decimals is the ſame as in whole numbers, keeping the place of units juſt under each other of the integers, and primes under primes of the decimals, *&c.*

l.			*l.*	*s.*	*d.*
From $\frac{7}{8}$	,875		the $\frac{7}{8}$ is	17	—6
Take $\frac{1}{4}$	,75		$\frac{1}{4}$ is	15	—0
Reſt	,125	or *s.* 2 *d.* —6	Reſt	2	—6

Equal to the Decimal, ,125.

Multiplication *of* Fractions.

1. TO multiply proper fractions, multiply the numerators together for a new numerator, and the denominators multiply together for a denominator.

Example. Multiply $\frac{7}{8}$ by $\frac{1}{4}$, *facit* $\frac{7}{32}$.

2. If a mixt number and a fraction are to be multiplied together, reduce the mixt number into an improper fraction, and work as in the laſt.

Example. Multiply $11\frac{2}{3}$ by $\frac{3}{4}$.

$\frac{35}{3}$ by $\frac{3}{4}$ *facit* $\frac{105}{12}$.

l. *l.*

Example. Multiply $11\frac{2}{3}$ by $2\frac{3}{4}$

l s d

$\frac{35}{3}$ by $\frac{11}{4}$ *fac.* $\frac{385}{12}$ or 32-1-8

3. To multiply a mixt number by an integer, make the integer an improper fraction, by placing [1] under it, and reduce your mixt number into an improper fraction, and work as in the firſt rule.

Example. Multiply $7\frac{5}{8}$ by 4

$\frac{61}{8}$ by $\frac{4}{1}$, *facit* $\frac{244}{8}$.

4. Multiplication of decimals is the ſame as in whole numbers, ſaving as many decimal parts as are in the multiplicand and multiplier, ſo many muſt be cut off from the product, which if it have not ſo many places, the defect muſt be ſupplied with cyphers towards the left-hand.

Multiply ,1005	11 ,83
by ,631	2 ,87
1005	8281
3015	9464
	2366
Facit ,0031 155	33, 9521

Diviſion *of* Fractions.

1. TO divide ſingle fractions: there is no need to reduce the fractions to a common denominator,

but multiply the numerator of a diviſor, by the denominator of the dividend. And contrary for the terms of the quotient thus:

Example. Divide $\frac{7}{8}$ by $\frac{1}{4}$

$\frac{1}{4}\frac{7}{8}$ ($\frac{2}{1}\frac{8}{4}$, or $1\frac{1}{0}$

2. If it happens that the fraction of the diviſor be greater than the fraction of the dividend, the facit of ſuch diviſion is a fraction.

Example. Divide $\frac{3}{4}$ by $\frac{7}{8}$

$\frac{7}{8}$) $\frac{3}{4}$ ($\frac{2}{2}\frac{4}{8}$

Facit $\frac{1}{1}\frac{2}{4}$

3. To divide an integer by a fraction, multiply the integer into the denominator, and divide by the numerator.

Example. Divide 8 by $\frac{5}{6}$

$\frac{5}{6}$) $\frac{1}{8}$ ($\frac{4}{5}\frac{8}{}$

$9\frac{3}{5}$ *Facit*

4. To divide a fraction by an integer, place the numbers as follows, and work as by the firſt rule.

Example. Divide $\frac{3}{4}$ by 3

$\frac{3}{1}$) $\frac{1}{4}$ ($\frac{1}{1}\frac{3}{2}$

Facit $\frac{1}{4}$

5. To divide a mixt number by an integer, reduce the mixt number into an improper fraction, whoſe denominator multiply by the integer for your diviſor.

Divide $3\frac{1}{8}$ by 2

$\frac{2}{1}$) $\frac{2}{8}\frac{7}{}$ ($\frac{1}{1}\frac{7}{6}$ or $1\frac{1}{1}\frac{1}{6}$ *facit*

6. To divide a mixt number by a fraction, reduce the mixt number into an improper fraction, and work as before.

Example. Divide $3\frac{1}{4}$ by $3\frac{4}{7}$

$\frac{4}{7})\frac{13}{4}$ ($\frac{105}{112}$ *facit*, or $6\frac{98}{112}$

7. To divide an integer by a mixt number, reduce the mixt number and integer into improper fractions, and proceed as before.

Example. Divide 5 by $3\frac{1}{3}$

$\frac{10}{3})\frac{5}{1}$ ($\frac{15}{8}$ *facit*
Or, $1\frac{7}{8}$ *facit*

8. To divide a mixt number by a mixt number, reduce them into improper fractions and divide as before.

Example. Divide $2\frac{1}{5}$ by $2\frac{3}{4}$

Or, $\frac{18}{5}$ by $\frac{11}{4}$
Facit $\frac{72}{55}$ or $1\frac{17}{55}$

Diviſion of decimals is the ſame as in whole numbers, till the work be done, and then uſe the converſe of the rule for multiplication, *viz.* ſo many decimals as are in the dividend, ſo many there muſt be in the diviſor and quotient; and if there be not ſo many, the quotient muſt be ſupplied with cyphers towards the left hand.

Example. Divide 33,9521 by 2,87

2,87) 525

2382

Facit 11,83 861

00

See the converſe in multiplication of decimals.

The Rule *of* Three *in* Fractions.

RULE: You muſt multiply your ſecond and third numbers together, and divide by your firſt.

Obſerving the ſame method as in whole numbers, *viz.* That the firſt and third numbers be of one name or denomination.

Example. If $3\frac{1}{4}$ d buy $\frac{3}{4}$ lb of tobacco, What ſhall $96\frac{3}{4}$ l buy?

$\frac{7}{2}$ of $\frac{1}{3\frac{1}{4}}$ — $\frac{7}{480}$ l — $\frac{3}{4}$ lb — $95\frac{3}{4}$ l

$\frac{4}{383}$ by $\frac{3}{4}$

$\frac{766}{12}$

Divide $\frac{766}{12}$ by $\frac{7}{480}$

7	766
84	2880
	2880
	3360
84)	367680
	316
	048
	600
	12

Facit 4377 lb of tobacco

The menſuration of plain ſuperficies (or flat meaſure) ſuch as board, glaſs, wainſcot, painting, and the like.

Note 1. THat in ſuperficial meaſure, 12 times 12 inches, being 144 inches, are the number of inches contained in a ſquare foot of ſuperficial meaſure.

2. That to ſquare any number, is to multiply it by itſelf, as if you would know how many ſquare feet is contained in a yard ſquare, multiply 3, the feet in one yard by 3, the product is 9, and ſo many feet make a yard ſquare.

Example. How many ſquare inches are there in a yard ſquare.

1 yard is 3 feet

12

36 inch
36

216
108

Facit 1296 inch

The general rule is to multiply the length by the breadth, the product is the content.

Example 1. A board 12 foot long, and 14 inches broad, how many ſquare feet?

12
14

144

576
144

144) 2016

576 Facit 14 *ſquare feet.*

00

Example 2. A piece of wainſcot 24 foot, 9 inches long and 11 feet deep, how many ſquare yards?

Feet.	Inch.			Yard.	Feet.	Inch.
24	9					
11		Mul.	*Facit*	30	2	3
			Or,	30	2	$\frac{3}{12}$
9) 272	3					

Example 3. A painter hath done a room, 90 foot about, and $11\frac{1}{2}$ foot high, I demand the ſquare yards therein?

Foot
11,5 High
90 About

9) 1035 (115 Yards for anſwer.
13
45

Note, This way 'tis done much truer and with fewer figures, and no charge to the memory.

Example. A glazier hath done a pane of glaſs of 5 foot 73, high, and 5 foot 54, broad, at 6 d the foot ſquare.

Note, The glazier's foot divided into 10 parts, and every part into 10 parts more.

5, 73
5, 54

2292
2865
2865

Facit, *feet*, 31,7442

A general rule to meaſure round or ſquare pillars.

Multiply the length by the circumference of round pillars.

And for ſquare pillars, add the ſides or breadth together, and multiply the total by the length.

Example 5. A painter hath done a pillar of 6 feet 3 inches circumference, and 14 feet 9 inches long, I demand the ſquare yards of painting?

The common and beſt way to do this, is by croſs multiplication thus,

Feet.	Inch
14—	9
6—	3
3—	8—3
88—	6

Facit, feet 92—2—3 anſwer.
Or, yards 10—2—2—3

Multiplying 9 by 3, gives 2 feet 3, put down the 3, and carry 2; then 3 times 14 is 42, and 2 is 44, which is 3 foot 8, which put down as you ſee.

Then 6 times 9 is 54. which is 4 feet 6, put 6 under the 8 (as being 12ths of a foot as the 8 is) then 6 times 14 is 84, and 4 is 88 So the ſum of the 2 lines is 92 feet 2′-3″. Or the feet divided by 9, is 10 yards 2 foot, 2 primes (or 12ths of a foot) and 3 ſeconds or 12ths of a 12th.

The ſame is done decimally thus:

14,	75 Feet
6,	35
	7375
	2950
	8850
9)92,	1875
Or yards 10.	2,1875 Feet.

For regular polygons, add all the ſides together, and multiply the total by half the neareſt diſtance from the center to one of the ſides.

For cones, multiply half the length by the circumference.

For pyramids, add all the breadth at the baſe together, and multiply half the length by the total.

For globes, multiply the area of the greateſt circle by 4, is gives the content.

Menſuration of Solids.

Solids; ſuch as ſtone, timber, *&c.* are meaſured by the cubic or ſolid foot; now a cube is a figure like a dye of 6 equal ſides, and a cubic foot contains 12 inches ſquare on every ſide.

THE rule is. multiply the length by the breadth, and that product multiply by the depth, which divide by 1728, the cubic inches in a foot ſolid.

Example.

A piece of timber 16 foot long, 14 inches broad, and 9 inches deep, how many ſolid feet doth it contain?

12	16
12	12
144	192
12	14
1728	768
	192
	2688
	9
1728)	24192 *Facit* 14 Feet
	6912
14	
	000

Example.

A ſtone 7 feet 3 inches long, 4 feet 5 inches broad, and 2 feet 3 inches deep, how many ſolid feet?

7—3	4—5	2—3
12	12	12
87 length	53	27
53 breadth		
261		
435	1628)	124497
4611		3537
27 deep	*Facit* 72 solid feet	81
32277		refts 1678
9-22		Or 6″-9‴

Facit 124497 cubic inches

But the way moſt uſed, and which is ſhorter and moſt like an artiſt, is this.

Inch	Feet
	4—5 broad
	2—3 deep
1—	1—3
8—	10—0
9—	11—3
7—	3—long
2—	5—9—9
69—	6—9
Feet	72—0—6—9

Only carrying the 12's both in your multiplication and addition.

To find how many inches in length make a ſolid foot of timber, multiply the number of inches ſquare in itſelf for diviſor, and make 1728, the cubical inches of a foot your dividend.

Example.

A piece of timber 18 inches ſquare, what length will it require to make a foot ſolid?

18
18

144
18
---
324)1728
Facit 5 inches 108

Example.

How many inches in length will make a foot, at 12 inches ſquare?

12
12
---
144)1728
288
Facit 12 inch.

PLANK MEASURE.

A table ſhewing how many feet make a load of plank of any thickneſs.

Inch thick	Foot to the load	Inch thick	Foot to the load
1	600	5	120
1½	400	5½	109,0912
2	300	6	100
2½	340	6½	92,076
3	200	7	85,714
3½	171,428	7½	80
4	150	8	75
4½	133,31	8½	70,588

The way to make this table, or to know how many feet of plank make a load of any thickneſs,

Rule. Say, if 12 inch thick, require 50 feet to make a load: what will 4 inch thick require? This by the reverſe rule of three gives 150, as you ſee by the operation.

12. 50 4.
12

4) 600 (150 feet for anſwer.

So that if you divide 600 by any thickneſs of plank, the quotient ſheweth how many feet thereof make a load.

2 Exam. If it were required to know how many load are in 5762 feet of plank 5 inches thick.

By the table 120 feet make a load; therefore divide 5762 by 120, and the quotient is loads.

120) 5762) 48 $\frac{1}{120}$ or $\frac{1}{60}$ loads.

Or multiply the feet given by 144, and that product by the thickneſs of the plank, then divide by 1728 the inches in a ſolid foot, and that quote is feet, which divide by 50 the feet in a load, and you have the loads without the table.

5762
144

829728
5

1728)4148640 (2400 (48 $\frac{1}{60}$ load.
6926 50)
1440

Note, The remainder $\frac{1440}{1728}$ is equal to 56 feet, and $\frac{1}{6}$ of $\frac{1}{50}$ is equal $\frac{1}{60}$ of the load as above.

Exam 3. In 1234 feet of 4 inches plank, how many load and ſolid feet?

150) 1234 (8 load.
3) 34 (11 ſolid feet.

For the ſolid feet, divide the remainder by the number of 50's contained in the diviſor; or by the times that the thickneſs of the plank is found in 12 as above.

Alſo, if the laſt example were done by the ſecond rule, under the ſecond example, 1234 multiplied by

144, gives 177696, and that by 4 inches thick, 710784, which divided by 1728, the quote is 411 feet, or 8 load (divided by 50) and 11 foot, as in the laſt rule and example.

3*dly*, To know how many feet of plank of any thickneſs make a tun. Say by the inverſe rule of three, as 12 to 40, ſo the thickneſs to the anſwer.

12. 40. 4.
12

4) 480 (120 feet in the tun.

And ſo may you make a table of the feet of any thickneſs in a tun (as is before ſhewed for the load) by only dividing the 480, by the thickneſs of the plank.

So in thickneſs	Feet make a tun
of 1 inch —	480
2 — —	240
3 — —	160
4 — —	120
5 — —	96
6 — —	80, *&c.*

A Short and Eaſy

METHOD

OF

BOOK-KEEPING.

INSTRUCTIONS.

Queſt. WHat is the firſt thing I muſt do, who deſign to keep my books of accompts after this method.

Anſw. You muſt make an inventory; an *example* of which is at the end of theſe *inſtructions*.

Q. How muſt I poſt the firſt part of this inventory?

A You muſt poſt it on your ledger, *viz. merchandize*, to the debit of that accompt.

Caſh, to the debit of your caſh-book.

George Maſon's debt, to the debit of his accompt.

Germain Bell's debt, to his debit alſo.

And for the whole ſum (*viz.* 730*l*) you muſt give counterpart in credit of ſtock.

Q. How muſt I poſt the other part of this inventory.

A To the credit of *Thos. Richards*, the ſum you owe him.

To the credit of *John Fair*, the ſum you owe him.

And for the whole ſum, (*viz* 100*l*) you muſt debit ſtock. See the ſeveral accompts, *fol.* 1, 2.

Q. I ſee by the firſt page of the day-book, that it contains entries of goods ſold to ſundry perſons: How muſt theſe be poſted.

A To debit of *Richard Hughs*, what ſold him.

To debit of *Anthony Coule*, the like.

To debit of *James Gray* and company, the like.

To debit of *Richard Hunt*, the like. See their accompts, Fol. 3. ledger.

And counterpart muſt be given for the whole ſum of this page (*viz.* 16*l* 10*s* 10*d*) on credit of merchandize in the ſaid ledger. See accompt of merchandize, Fol. 1. ledger.

And the like muſt be done for the pages 2, 3, 4, 5 and 6 of the ſaid day-book.

Note, That the ready money taken for goods ſold is poſted each month to the debit of your caſh book.

Q. How muſt I enter the monies I receive (of debtors on my ledger?)

A On your debit ſide of your caſh-book. See that book.

Q. How muſt I poſt thoſe ſums received into my ledger?

A To the credits of the perſons, of whom received, See the accompts of

Richard Hughs —— —	Fol. 3
Anthony Coule — ——	Fol. 3
John Gray and company	Fol. 3
Thomas Wilſon —— —	Fol. 3
Henry Trap —— ——	Fol. 4

Q. How muſt I poſt (into my ledger) the total receipts of the month of *Auguſt* (*viz.* 57*l* 3*s* and 10*d*.

A You muſt poſt that total to the debit of your caſh, in your ledger, writing,

To *ſundries*. Received *per* caſh-book. See the account of caſh, in the ledger, Fol. 1

Do the like for *September* and *October*'s receipts.

Q. How muſt I enter the monies I pay to thoſe I owe to, and who have credit in my ledger

A On the credit-ſide of your caſh-book. See the caſh-book.

Q. How muſt I poſt thoſe ſums paid?

A To the debits of the perſons to whom paid. See the accompts of *Thomas Richards*, Fol. 2. and *John Fair*, Fol. 2. in your ledger.

Q. How muſt I poſt (into my ledger) the total payments of the month of *Auguſt* (*viz.* 30*l.*)

A. You muſt poſt it to the credit of your caſh, in your ledger, writing,

By *ſundries* paid *per* caſh-book. See the accompt of caſh in your ledger, Fol. 1.

Q. I underſtand by theſe directions, how to ſtate and poſt my books, How muſt I proceed in balancing my ledger?

A Value your merchandize remaining unſold, and enter the ſum of their value on credit of the accompt of merchandize, in your ledger. See the accompt of merchandize, Fol. 1.

And give the counterpart in debit of the accompt of balance in the ſaid ledger. See the debit of balance, Fol. 4.

Which done, ſubtract the debit ſide of the ſaid accompt of merchandize from its credit, and place the remainder (*viz.* 97*l* 10*s*) on the debit ſide of it. See the accompt, Fol. 1.

And give counterpart on credit of profit and loſs in the ſaid ledger. See accompt of profit and loſs, Fol. 4.

Then add up debtor and creditor of the accompt of caſh in the ſaid ledger, and ſubtract the credit from the debit, and place the caſh remaining (*viz.* 297*l* 7*s* 1*d*) on credit of the ſaid accompt of caſh. See the accompt, Fol. 1. and give connterpart in debit of the accompt of balance. See ſaid accompt of balance, Fol 4.

Q. How muſt I do with the accompt of expences?

A. Write on its credit ſide (the 32*l*) by profit and loſs, and give counterpart in debit of the accompt of profit and loſs. See both the accompts, Fol 2, 4.

Q. How muſt I do with the accompt of *George Maſon*, who, I find by his accompt, owes me 10*l*

A You muſt write on credit of his accompt by balance now owing to me 10*l*

And give counterpart, on debit of balance. See both the accompts, Fol. 2, 4.

Do in the ſame manner by the accompts of

Germain Bell —— — Fol. 2
Richard Hughs — — Fol. 3
John Gray and company Fol. 3
And *Thomas Wilſon* — Fol. 3

See their particular accompts in your ledger?

Q How muſt I do with the accompt of *Thomas Richards*, to whom I find I owe 20*l*

A You muſt write on the Debit of his accompt. To balance now due to him 20*l*

And give counterpart on credit of balance. See both the accompts, Fol. 2, 4.

Do the like with the accompt of *John Fair*. See his accompt, Fol. 2.

Q How muſt I do to balance or cloſe the accompts of ſtock, profit and loſs.

A Subtract the debit, or profit and loſs from its credit, and ſet the remainder (*viz.* 65*l* 10*s*) being your clear gains during the time of this trade, on the debit of profit and loſs. See the accompt, Fol. 4.

And give counterpart in credit of ſtock. See accompts of ſtock, Fol 4.

Q How muſt I do to balance the accompts of ſtock.

A Subtract its debit from its credit, and ſet the remainder (*viz.* 685*l* 10*s* being your preſent net ſtock) on the debit of ſtock, See the accompt, Fol. 1.

And give counterpart in credit of balance. See accompt of balance, Fol. 4.

This done, your ledger is balanced, and the accompt of balance, Fol. 4.

This done your ledger is balanced, and the accompt of balance (if you have proceeded right) will be equal on both ſides.

The INVENTORY.

London, Auguſt 1. 1757.

I Have merchandize of ſundry ſorts to the value of ——		*L.*	520—00—00
In caſh or ready money ——			180—00—00
Owing to me, by			
Richard Maſon —— ——			20—00—00
Germain Bell —— ——			10—00—00
Owing by me, to			
Thomas Richards	*L.* 60—00—00		
John Fair —— ——	50—00—00		
——		*L*	110—00—00
My net ſtock			620—00—00

Caſh-Book. I.

	Receipts——Debtor.	l.	s.	d.
	August, 1757.			
1	To ſtock by inventory —	1	180	00 00
8	*Richard Hughs*, of him —	3	4	00 00
12	*Anthony Coule*, ditto ——	3	3	6 06
16	*John Gray* and company, ditto	3	1	10 06
20	*Thomas Wilſon*, ditto ——	3	4	13 00
30	*Henry Trap*, ditto — —	4	0	15 00
pt. 31	Merchandize ſince 1ſt of *Auguſt*		42	18 10
	L. 57—03—10 Received		237	03 10
	September, 1757.			
	Laſt balance.	3	207	03 10
11	*Richard Hughs*, of him —	3	8	15 11
—	*Anthony Coule*, ditto ——	2	3	00 00
15	*George Maſon*, ditto ——	2	10	00 00
20	*Germain Bell*, ditto ——	4	5	00 00
24	*Henry Trap*, ditto ——	3	2	06 00
30	*John Gray* and company, ditto		2	00 03
—	Merchandize ſince 1ſt of *September*		38	06 06
	L. 69—18—08 Received		276	12 06

I.

Payments —— Creditor.

			l.	s.	d.
		August, 1757.			
23	By *Thomas Richards*, to him ——	2	20	00	00
31	*John Fair*, ditto —— ——	2	10	00	00
	Paid this month		30	00	00
	Resting *per* balance		207	03	00
			237	03	10
		September 1757.			
	John Fair, to him —— —	2	5	00	00
22	*Thomas Richards*, ditto —— ——	2	10	00	00
28					
	Paid this month		15	00	00
	Resting *per* balance		261	12	06
			276	12	06

2.

Receipts —— Debtor.

			l.	s.	d.
		October, 1757.			
		Last balance	261	12	06
11	To *Anthony Goule*, of him ——	3	2	00	00
20	*John Biddy*, ditto —— ——	4	2	8	00
31	*John Gray* and company, ditto	3	5	15	03
pt.	— Merchandize since 1*st* of *October*		86	11	04
	L. 97—04—07 Received		358	17	01
		November, 1757.			

2.

	Payments——Creditor.	l.	s.	d.
	October, 1757.			
15	By *Thomas Richards*, to him ——	2	10	00
28	*John Fair*, ditto ——	2	20	00
31	Expences, *&c.* since 1*st* of *Auguſt*	1	32	00
	Paid this month		62	00
	Reſting *per* balance	296	17	01
		358	17	01
	November, 1757.			

A

DAY-BOOK,

OR

JOURNAL.

Day-Book. 1.

	Accompts debtor to merchandize.		*l.*	*s*	*d.*
	Sold.				
	Auguſt 1. 1757.				
3	*Richard Hughs*,				
	39½ ells linnen, at ———	*s.* 3—2	6	05	01
	——— ditto ———	———			
3	*Anthony Coxle*,				
	58½ ells of linnen, at ———	*s.* 2—4	6	16	06
	——— ditto 5. ———	———			
3	*John Gray* and company,				
	3 doz ſciſſars, at 4. 0 ———	*l.* 0—12—0			
	3 doz. ditto 3. 9. ———	0—11—3			
	6 doz. round points 3. 9.	1—02—6			
	6 doz. middling 2. 8. ———	0—16—0			
		———	3	01	09
	——— ditto 10 ———	———			
3	*Richard Hughs*,				
	3 maſſes of pearl, at ———	*l.* 0—2—6	0	07	06
		———			
		Merchandize ſold	16	10	10

Day-Book. 2.

Accompts debtor to merchandize.

					l.	s.	d.
	Sold.						
	August 17. 1757.						
3	*Thomas Wilson*,						
	12 doz. ſciſſars	4	3	L. 4—12—6			
	6 doz. middling	4	3	1—05—6			
	9 doz. ditto	2	8	1—04—0			
	20 doz. ſmall	1	6	1—10—0			
					8.	13.	00
	——— ditto 20						
3	*Anthony Coule*,						
	1 looking glaſs			L. 0—08—6			
	1 ditto middling			0—09—6			
	3 tortoiſe ſhell combs			0—06—0			
					1	04.	00
	——— di to 23						
4.	*Henry Trap*,						
	1 doz. ſciſſars with caſes			L 0—09—6			
	1 doz. without caſes			0—05—6			
					0	15	00
	Sold.						
	August 27. 1757.						
3	*Richard Hughs*,						
	3 pair ſciſſars half barb			L. 0—06—0			
	1 doz. ditto, ſmall ſet			0—05—0			
	2 knives at 20*d*			0—03—4			
	1 doz comb-bruſhes			0—03—0			
	6 pen knives, at 8*d*			0—04—0			
	12 doz claſp knives			1—17—0			
	24 doz. knives horn handed			3—00—0			
					5	18	04
				Merchandize ſold	16	10	04

Day-Book. 3.

Accompts debtor to merchandize.

Sold.

August 31. 1757.

1 Receipts in ready money for goods since the 1st of *August* — — — — 12 18 10

September 3. 1757.

4 *Henry Trap*
A parcel of ſciſſars — — — — — 0 12 00

— — — ditto 6 — — — — — —

3 *Richard Hughs*,
2 maſſes pearl, at — — — — s. 2—6 0 05 00

— — — ditto 11 — — — — — —

3 *Richard Hughs*,
13 ells cloth, at — — — — s. 2—6 1 12 06

— — — ditto 15 — — — — — —

3 *Anthony Coule*,
4 maſſes pearl 2 6 L 0—10—0
1½ doz. pendants 4 6 0—06—0
0 16 00

— — — ditto 16 — — — — — —

4 *Henry Trap*,
12 doz. horn trumpets 2 L 1—04—0
2 doz. comb bruſhes 3 0—06—0
2 doz. ditto — 2 0—04—0
1 14 00

Merchandize ſold — 47 18 04

Day-Book. 4.

					l.	s.	d.
	Accompts debtor to merchandize.						
	Sold.						
	September 30. 1757.						
4.	*John Biddy*,						
	3 masſes Ven. pearl, at	L.	1	00	0		
	2 doz. ſciſſars, at —— ——		0	09	0		
	13 doz. fine combs, at ——		1	09	0		
						2	18 00
	—— —— ditto —— — —— ——						
3.	*John Gray* and company,						
	1 piece white gauſe qt. 24 ells —— ——						
	1 piece —— ditto — 22 —— ——						
	1 piece —— ditto —— 20 —— ——						
	1 piece —— ditto — 18 —— —— ——						
	1 piece yellow ditto — 20 —— ——						
	1 piece black ditto — 19 —— —— ——						
	Ells —— 123 at 21*d*					10	15 03
	—— —— —— ditto —— —— ——						
1.	Receipts in ready money for goods ſince the 1ſt of *September* —— ——					38	6 6
	October 2. 1757.						
3.	*Thomas Wilſon*,						
	1 doz. ſciſſars with caſes, at	L	0	12	0		
	4 maſſes pearl, at 2*s* 0*d*		0	08	0		
	9 maſſes, ditto, at ——		3	17	4		
						4	17 4
	Merchandize ſold					56	17 01

Day-Book. 5.

					£.	s.	d.
Accompts debtor to merchandize.							
Sold.							
October 29. 1757.							
Thomas Wilson,							
2 pieces tabby, qt. 61 ells——8*s* 6*d*			*L*	25	18	6	
1 piece ditto, qt. 28 ells,——8*s* 6*d*				11	18	0	
					37	16	6
ditto 31							
Receipts in ready money for goods since the 1st of *October*					86	11	4
Merchandize sold—					124	07	10

THE

LEDGER.

ALPHABET.

B

Bell, Germain 2
Biddy, John 4
Balance 4

C

Coule, Anthony 3
Cash 1

E

Expen. and abatem. 1

F

Fair, John 2

G

Gray, John and comp. 3

H

Hughs, Richard 3

M

Merchandize 1
Mason, George 2

P

Profit and loss 4

R

Rept. and paym. cash. 1
Richards, Thomas 2

S

Stock 1

T

Trap, Henry 4

W

Wilson, Thomas 3

Ledger. 1.

			l.	s.	d.
		Stock——————Debtor.			
1757					
Aug.	2	To ſundry to whom I owe ——	110	00	00
Oct	31	To balance N. ſtock	685	11	00
			795	11	00
		Merchandize, Debtor.			
1757					
Aug	1	To ſtock *per* inventory	520	00	00
Oct.	31	To *P.* and *L.* carried thither	97	10	00
			617	10	00
		Receipts or Caſh, Debtor.			
1757					
Aug.	1	To ſtock, money *per* inventory —	180	00	00
	31	To ſund. *per* book, page 1 ——	57	03	10
	31	To ſundries —— — 1 ——	69	18	08
	31	To ſundries — —— 1 ——	97	04	07
			404	07	01
		Expences, *&c.* Debtor.			
1757					
Oct.		To payment hereon ſince 1 *Aug.*	1	31	19	00

Ledger I.

				l	l. s.	
		Stock——Creditor.				
1757						
Aug.	13	By ſundry *per* inventory ——			731	00 00
Oct.	31	By pro. and loſs, gain'd in 3 mon.		4	65	11 00
					795	11 00
		Merchandize, Creditor.				
1757						
Aug.	10	By ſundries ſold, day-book	1 —		16	10 10
	27	By ſundries —— page ——	2 —		16	00 04
Sept.	16	By ſundries —— ——	3 —		47	18 04
Oct.	02	By ſundries —— ——	4 —		56	17 01
	31	By ſundries —— — ——	5 —		124	07 10
					262	14 95
		By bal. value of remains ——		4	354	15 07
					617	10 00
		Payments or Caſh, Creditor.				
1757						
Aug.	31	By ſundries *per* book ——	1 —		300	00 00
Sept.	30	By ſundries—page —— —	1 —		150	00 00
Oct.	31	By ſundries—page ——	1 —		620	00 00
					107	00 00
		By balance, reſt in caſh — ——		4	297	07 01
					404	07 01
		Expences, &c. Creditor.				
1757						
Oct.	31	By profit and loſs carried there —		4	31	9 0

Ledger 2.

				l.	d.	d.
1757						
Aug.	1	*George Maſon*, Debtor.				
		To ſtock, now owing me — —	1	20	00	00
1757		*Germain Bell*, Debtor.				
Aug.	1	To ſtock now due to me — —	1	10	00	00
1757		*Thomas Richards*, Debtor.				
Aug.	23	To payment, to him — — —	1	20	00	00
Sept.	28	To ditto — — — —	1	10	00	00
Oct.	25	To ditto — — — — —	1	10	00	00
				40	00	00
		To balance now due to him — —		20	00	00
				60	00	00
1757		*John Fair*, Debtor.				
Aug.	31	To payment, to him — — —	1	10	00	00
Sept.	23	To ditto — — — —	1	5	00	00
Oct.	28	To ditto — — — — —	1	20	00	00
				35	00	00
		To balance now owing him — —	4	15	00	00
				50	00	00

Ledger 2.

				l.	s.	d.
1757		*George Maſon*, Creditor.				
Sept.	15	By receipt of him	1	10	00	00
Oct.	31	By balance now owing me	4	10	00	00
				20	00	00
1757		*Germain Bell*, Creditor.				
Sept	20	By receipt of him	1	5	00	00
Oct.	31	By balance, now owing me	4	5	00	00
				10	00	00
1757		*Thomas Richards*, Creditor.				
Aug.	1	By ſtock now owing him	1	60	00	00
1757		*John Fair*, Creditor.				
Aug.	1	By ſtock now due to him	1	50	00	00

Ledger 3.

				l.	s.	d.
1757		*Richard Hughs*, Debtor.				
Aug.	1	To merchandize sold him	1	6	5	1
	10	To ditto	1	0	7	6
	27	To ditto, a parcel	1	5	18	4
Sept.	6	To ditto, 2 masses of pearl	1	0	5	00
	11	To ditto, 13 ells of cloth	1	1	12	6
				14	8	5
1757		*Anthony Coule*, Debtor.				
Aug.	5	To merchandize sold him	1	6	16	6
	20	To ditto, a parcel	1	1	4	00
Sept.	15	To ditto, a parcel	1	0	16	00
				8	16	6
1757		*John Gray* and comp. Debtor.				
Aug.	5	To merchandize, a parcel	1	3	1	9
Sept.	30	To ditto, a parcel	1	10	15	3
				13	17	00
1757		*Thomas Wilson*, Debtor.				
Aug.	17	To merchandize, a parcel	1	8	13	00
Oct.	2	To ditto, a parcel	1	4	17	4
	29	To ditto, a parcel	1	37	16	6
				51	6	10

Ledger 3.

					l.	s.	d.
1757		*Richard Hughs*, Creditor,					
Aug.	8	By receipt of him		1	4	00	00
Sept	11	By ditto		1	8	15	11
					12	15	11
		By balance now owing me		4	1	12	6
					14	8	5
1757		*Anthony Conle*, Creditor,					
Aug	12	By receipt of him		1	3	6	6
Sept	11	By ditto		1	3	00	00
Oct.	11	By ditto		1	2	00	00
		Balance				10	00
						10	6
1757		*John Gray* and comp Creditor.					
Aug.	16	By receipt of them		1	1	10	6
Sept.	30	By ditto		1	2	00	3
Oct.	31	By ditto		1	5	15	3
					9	6	00
		By balance now owing me		4	4	11	00
					13	17	00
1757		*Thomas Wilson*, Creditor.					
Aug.	20	By receipt of him		1	4	13	00
Oct.	31	By balance now owing me		4	46	13	10
					51	06	10

Ledger 4.

				l.	s.	d.
		Henry Trap, Debtor.				
1757 *Aug.*	23	To merchandize, a parcel	1	0	15	00
Sept.	2	To ditto	1	0	12	00
	16	To ditto	1	1	14	00
				3	1	0
		John Biddy, Debtor.				
1757 *Sept.*	30	To merchandize, a parcel		2		00
		Profit and loss, Debtor.				
1757 *Oct*	31	To expences, *&c.* brought here	2	31	19	00
		To stock, gained since *Aug.* 1st	1	65	1	00
				97	0	00
		Balance, Debtor.				
175 *Oct*	31	To mercha dize now remaining	1	154	16	7
		To receipts, or cash resting	1	297	17	1
		To *George Mason*, now owing	2	10	00	00
		To *Germain Bell* ditto	2	5	00	00
		To *Richard Hughs*, ditto	3	1	12	6
		To *John Gray* and company, ditto	3	4	11	00
		To *Thomas Wilson*, ditto	3	46	13	00
		To *Anthony Coule*, ditto	3	00	10	10
				720	11	00

Ledger 4.

				l	s.	d.
		Henry Trap, Creditor.				
1757 Aug	30	By receipt of him		1	0 15	00
Sept	24	By ditto in full		1	2 06	00
					3 01	00
		John Biddy, Creditor.				
1757 Oct.	20	By receipt in full		1	2 18	00
		Profit and loss, Creditor.				
1757 Oct.	31	By merch. to close that accompt		1	97 19	00
		Balance, Creditor				
1757 Oct.	31	By *Thomas Richards*, I owe him		2	200	00
		By *John Fair*, ditto		2	150	00
					350	00
		By stock, for its neat		1	685	00
					720 11	00

DIRECTIONS.

Queſt. HAving taught me how to ſtate, poſt, and balance my books; what method muſt I uſe at the going out of theſe books into other?

Anſw. From the balance of theſe books (ſee ledger, fol. 4.) you muſt draw out another inventory, as follows:

The INVENTORY.

London, October 31. 1757.

I Have in merchandize of ſundry ſorts to the value of	*L.*	354	16	07
In caſh, or ready money —— —		297	07	01
Owing to me, by				
George Maſon —— ——	*L*	10	00	00
Germain Bell —— — — — —		5	00	00
Richard Hughs —— — ——		1	12	06
John Gray and company —— —		4	11	00
Thomas Wilſon — — — — —		46	13	10
Anthony Coule — — — — —		00	10	00
		720	11	10
Owing by me, to				
Thomas Richards *L.* 20 00 00				
John Fair — — 15 00 00				
—— *L*		35	00	00
My neat ſtock		685	11	00

And poſt it into your new ledger, as by the directions given for the poſting your other inventory.

Q. In the caſh book on debtor ſide, (for inſtance, in the month of *Auguſt*) are figures juſt before the money-lines, as 1 before 18*o*/ and 3 before 4*l*, *&c.* I deſire to know what thoſe figures ſhew.

A The figure 1 (before 180*l* in the firſt line) ſhew the folio of the ledger, on which the accompt of ſtock ſtands.

The figure 3 following *Richard Hughs*, in the next line, ſhews the folio of the ledger, whereon the accompt of *Richard Hughs* ſtands.

The like is to be underſtood of the figure 3 following *Authony Coule*: the 3 following *John Gray* and company: the 3 following *Thomas Wilſon*, and the 4 following *Henry Trap*, on debtor ſide of the ſaid caſh-book for the month of *Auguſt*, and of thoſe on debtor ſide, of the ſaid book for the months of *September* and *October*.

Q What do the figures (on the creditor ſide of the ſaid caſh-book) which come juſt before the money lines ſhew? For inſtance, in the month of *Auguſt* on creditors ſide, of the figure 2 following *Thomas Richards* juſt before the 20*l*, and the 2 following *John Fair*, juſt before 10*l*.

A The figure 2 following *Thomas Richards*, ſhews that his accompt ſtands in ledger, folio 2. And the 2 following *John Fair*, ſhews that his accompt ſtands alſo in the ſaid ledger, folio 2.

The like is to be underſtood of the figures 2, 2 on creditor ſide of the caſh book for *September*.

And of the figures 2, 2, 2 on creditor ſide of the caſh book for *October*.

Q What does the *L*. 57 : 3 : 10, at the foot of the debtor ſide of the caſh book for the month of *Auguſt*, ſhew.

A It ſhews the total ſum received during the month of *Auguſt*, and is produced by ſubtracting the 180 *l*. in the firſt line from the *L*. 237 : 3 : 10, on the debtor of that accompt.

The like is to be underſtood of the *L* 69 : 18 : 8, at the foot of *September*, and of the *L*. 97 : 8 : 7, at the foot of *October*.

And as thoſe ſums ſhew the total receipt during each month, ſo the ſum 30*l* on credit ſide of the caſh book for *Auguſt*, the ſum of 15*l* for *September*, and the 62*l* for *October*, ſhew the total payment during each of thoſe months.

Q How is the balance (or reſt of money) in caſh found.

A You muſt ſubtract the 30 *l* (on credit of *Auguſt*'s caſh book) from the *L.* 237 : 3 : 10, on the debit ſide and the remainder being *L.* 207 : 3 : 10, the balance, or reſt of money, in caſh, which placed under the 30 *l* paid, and added to it, makes a juſt balance with the debtor ſide. See the caſh book for the month of *Auguſt*.

You are to do in the like manner to find the balance, or reſts of caſh for the months of *September* and *October*. See the caſh book for theſe months.

Q What does the figure 3 againſt *Richard Hughs* (in the day book) and the 3 againſt *Anthony Coule*, and the other figures in the margin of the day book, ſhew.

A They ſhew the folios of the ledger whereon the accompts of *Richard Hughs*, *Anthony Coule*, and the other accompts ſtand.

And alſo ſhew that thoſe perſons or accompts are debtors; as the figure 1 under the ſmall line of the margin, and at the foot of each page of the day book, juſt againſt the words merchandize ſold ſhews that the accompt of merchandize ſtands in the ledger, on folio 1, and is creditor.

Q What do the figures in the ledger coming juſt before he money lines on debtor ſide, ſhew.

A As the words of each line on the debtor ſide of ſaid ledger, immediately following the word to, ſhews what accompts or perſons are to be credited, or counterparted, ſo thoſe figures ſhew on what folios in the ledger thoſe accompts or perſons are to be found.

Q What does the figures coming juſt before the money lines on the creditor ſide of the ledger ſhew.

A As the words in each line on creditors ſide of the ſaid ledger immediately following the word by, ſhews what accompts or perſons are debited or counterparted, ſo thoſe figures ſhew on what folios in the ledger thoſe accompts or perſons are to be found.

Q How muſt I enter the goods I buy.

A You muſt enter them in a bought book: as for inſtance.

Merchandize debtor to perſons.

Bought

Of (ſuppoſe) *Richard Thomas*, viz.

46 ells linnen, at 3*s* *per* ell . . .	*L.* 6—18—0	
52 ells ditto, at 4*s* *per* ell . . .	10—08—0	
		L. 17—6—0

This article (and others of the like nature) muſt be poſted in your ledger, to the credit of the accompt of the perſons of whom bought, here *Richard Thomas*: and and the to al of each page in the bought book, muſt be poſted in the ſ id ledger to the debit of accompt of merchandize.

Q I have been told that a good method of book-keeping will ſhew the owner of the books, or others concerned, theſe following neceſſary (and many other) particulars, *viz.*

Concerning merchandize.

N° 1. What goods (during the whole, or any time of the accompt) have been bought, brought into charge, when, of whom, and at what prices.

2. What goods (as above) have been ſold, iſſued out of the charge, when, to whom, and at what price.

3. The whole quantity bought and ſold, and the profit, or loſs, ariſing on thoſe ſo diſpoſed of.

Concerning caſh or money.

4. What ſums of money have been received (as above) to whom, and on whoſe account. Alſo whether in part or in full.

5. What ſum total has been received and paid (during the whole. or during any time as above, and conſequently the ſum reſting in caſh.

Concerning perſons with whom I deal.

6 For what ſums they ſtand indebted, from what dates, and for what.

7. For what ſums I ſtand indebted to them, from what dates, and for what.

8 Whether any balance, or remainder, be due from them to me, or from me to them, and what ſum.

Concerning my expences.

9. What expence I have been at (during the time of the accompt, or any part of it) and ſuch expence conſidered and allowed; then what neat gain or loſs has attended.

Concerning my ſtock.

10. What ſtock I began with, and what my preſent ſtock is, and what particulars compoſed each.

Now I deſire you to ſhew me how this method will anſwer all theſe particulars.

A Concerning merchandize, your bought book will ſhew you the particular demands of numb. 1.

And your day book thoſe in numb. 2.

The debtor ſide of accompt of merchandize in your ledger will ſhew the whole quantity bought, and its creditor ſide the whole quantity ſold, and the ſame accompt ſhews you alſo the profit and loſs ariſing on thoſe you have diſpoſed of. See the accompt of merchandize in ledger, folio 1. thus the demands number 3. are ſhewn.

Concerning caſh or money, the debtor ſide of your caſh book anſwers the demands in number 4. and the creditor ſide of the ſaid book ſhews the demands in number 5 and conſequently thoſe in number 6. by comparing the debtor and creditor ſides.

The creditor ſide alſo of the ſaid book, ſhews the balance (or reſt that ſhould be found) in caſh.

Concerning perſons with whom you deal.

The debtor ſides of their accompts ſhew the demands of number 6. and the creditor ſides thoſe of number 7.

And conſequently their accompts compared in debtor and creditor, ſhew the demands of number 8.

Concerning your expences.

The accompt of expences in your ledger ſhews your expences, as in number 9. and the accompt of profit and loſs, will ſhew the neat gain or loſs

Concerning your ſtock.

The accompt of ſtock in your ledger ſhews what you began with, and the accompt of balance ſhews your preſent ſtock, and of what particulars it conſiſts, and anſwers the demands in number 10.

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